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The Physiotherapy Review

Vol. XII No. 3

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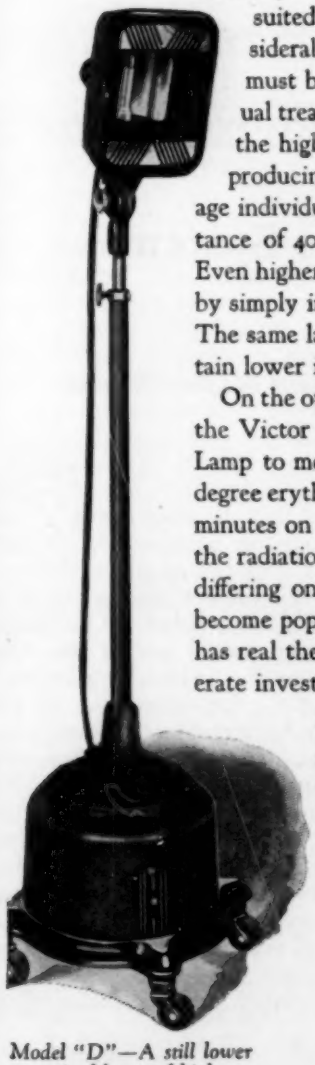

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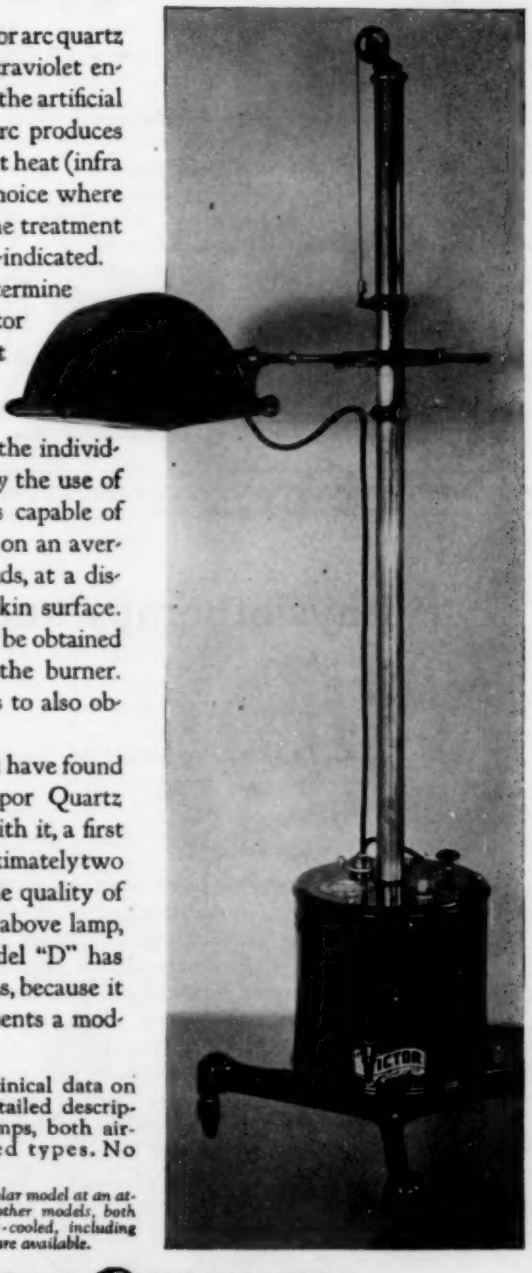

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Editor-in-Chief:
DOROTHEA M. BECK,
21 Church St., Montclair, N. J.

Associate Editor:
IDA MAY HAZENHYER
1621 Columbia Ave., Chicago, Ill.

General Manager:
GERTRUDE BEARD,
2449 S. Dearborn St., Chicago, Ill.

Address all correspondence for publication to the Editor.

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Physiotherapy and the Nervous System

By E. W. Taylor, Professor of Neurology-Emeritus, Harvard Medical School

The past three or four decades have seen an extraordinary change not only in the understanding of disease processes but as a natural corollary, changes of great importance in treatment. Drugs, formerly almost the sole resource, have given way to more rational methods based on the source of the difficulty rather than on its symptoms. It is natural, under these circumstances, that physical methods of treatment have come to occupy a prominent place. This has furthermore been fostered by the inevitable development of specialism which in various fields of medicine has delved far below the surface in the attempt to get at ultimate etiology. With this progress of specialism has naturally come a narrowness of outlook which has led to certain dangers in the application of therapeutic measures. This applies to physiotherapy as to other methods of treatment.

It is therefore, essential that physiotherapists, about whom for the moment we are particularly concerned, should have as broad an outlook as possible relative to the anatomy and physiology of the body if they are to approach their difficult problems in a reasonable and efficient way. This is particularly true of the nervous system as a whole and its main functions. A fundamental knowledge of anatomical structure is essential, if corrective treatment is to be carried out with intelligence. Furthermore the main principles of physiology should be inculcated to the end that the activities of the underlying physical structure may be understood. If such fundamental knowledge is acquired by physiotherapists it follows as a natural consequence that errors in treatment may, in part at least, be avoided. The danger in any mechanical form of treatment is that the vision of the therapist is limited to the particular part of the body under treatment and the important fact of the reaction of the patient to such treatment ignored. It has been very wisely said that, at least up to rather recent times, doctors have treated the disease and ignored the patient. This very just criticism applies equally or perhaps in even greater degree to those who are concerned with and vitally interested in any particular form of therapeutics.

In general the three fundamental functions of the nervous system should be borne in mind:—First, the function of motility; second, the function of sensibility and; third, and in many ways most important, the function of mentality, together with the relationship of these activities.

Motility:—In order properly to understand the many affections in which the motor system is involved, it is essential that a sharp distinction should be made between those disorders which affect the brain and the spinal cord primarily and those which affect the peripheral nerves. In order clearly to grasp this distinction it is necessary

to know something of the whole voluntary motor system on its anatomical side. Fortunately this is not a particularly complex matter, at least in its essential outlines. What we speak of as the voluntary motor system, by which is meant that part of the nervous mechanism over which we have control, consists of two segments, or more exactly two neurones, which, connected in the spinal cord, constitute the so-called motor tract extending from the cortex of the brain to the various muscles of the periphery. The first function of this tract of fibres taken in its entirety is to provide the possibility of voluntary motion which originates in the brain and finds expression in muscle movement. Apart from this, however, the two segments or neurones differ materially in their function and herein lies a most important clinical differentiation.

The upper segment, extending from the brain throughout the spinal cord is to be regarded, among its other functions, as inhibitory or, in other words, as a controlling mechanism. If, therefore, for any reason, as happens continually in disease, this upper system of neurones is interrupted in its course, the lower neurones going to the muscles overact, no longer being under central control, with the result that the muscles become hypertonic and the condition of so-called spasticity ensues. In such lesions there is never any muscular atrophy for the reason that these neurones, known collectively as the pyramidal tract, do not connect directly with the muscular system. This connection is effected in the ventral horns of the spinal cord where a second neurone, as already indicated, originates and finds its termination in the muscles. Any destructive lesion of this peripheral neurone results in an entirely different series of phenomena from what occurs when the upper neurone is involved. Instead of spasticity there is flaccidity accompanied by atrophy. Inasmuch as the muscles are dependent for their integrity on these peripheral neurones it should always be borne in mind that a peripheral motor nerve made up of individual neurones is without functional meaning in the absence of muscles and the converse. One should always picture, therefore, the nerve and the muscle as a single functional unit.

As a result of this anatomical arrangement it becomes at once apparent that, although paralysis results, whichever segment is involved, the type of paralysis is quite different. In the upper lesion we have spasticity without atrophy and in the lower, atrophy without spasticity. From a practical standpoint, obviously, mechanical treatment of these conditions is also quite different. Any exercises, massage or electricity which tends to increase activity of the motor mechanism should definitely be avoided. The contractions which develop may well be treated by manipulation, but any attempt to relieve the condition through electrical stimulation is entirely useless and may be positively detrimental. Massage is also not indicated in these spastic conditions.

On the other hand, the problem involved in the treatment of lower motor neurone diseases or disorders is to increase if possible the activity of the muscles and to stimulate the underacting nerves. To accomplish this is exceedingly difficult in any marked degree but the attempt should certainly be made. So-called muscle training is extremely valuable when certain muscles or groups of muscles have been weakened and are atrophic in order, so far as may be possible, to overcome the tendency to deformity. In such cases it is often desirable to neglect the muscles which are still functioning normally and devote attention to those which are weak and partially disabled. General massage is of little avail; electricity has been proved to be of some slight value which may be used in skilled hands always, however, bearing in mind that there is danger of still further weakening an already weakened muscle by over stimulation. For example, the plan now generally adopted in the treatment of poliomyelitis of resting the muscles for a considerable time after the onset is altogether preferable to the earlier idea that a weak muscle should be stimulated and otherwise treated at the earliest possible moment. Conservatism should always be exercised and the more definitely it is understood exactly what the underlying pathological process is the more intelligent naturally will be the treatment undertaken.

A sharp distinction should also be made between those lesions which affect what is commonly spoken of as the central nervous system as opposed to those which affect the peripheral system as, for example, in the various forms of neuritis. It is a well recognized fact that diseases involving the motor tract in the brain or the spinal cord are irremediable and that the results apparently obtained through treatment are in great measure due simply to natural processes through the absorption of exudates and the partial restoration of the function of neurones not completely destroyed. Discouraging as the treatment of these disturbances therefore is, the situation is very different if the peripheral nerve outside the spinal cord is involved. Although there may be the most extreme atrophy and loss of power resulting from disease or injury of the peripheral nerves, they have a most surprising capacity of recovery and here, although nature is again the chief restorer, much may be done through carefully devised mechanical treatment to keep up the nutrition of the muscles until the nerve is finally so far restored that it can take on again its trophic function.

Sensibility:—Up to this point mention has alone been made of the motor portion of the nervous system. Equally important is the sensory mechanism through which peripheral stimulation and sensation in general is conveyed upward through the peripheral nerves into the cord, finally reaching the brain. The anatomical relations of the sensory system are much more complex than those of the motor. Suffice it to say that here again neurones are superimposed one upon another until the fibres finally reach the so-called sensory areas of the brain cortex. Naturally lesions in the sensory system lead to loss or disturbance of the various forms of sensation together with certain reflex changes. Here again if the central sensory mechanism is involved recovery is unsatisfactory although perhaps not so striking as in the motor system.

It should be understood that what we speak of as a peripheral nerve with certain exceptions is made up both of motor and sensory fibres, the motor impulse passing outward and the sensory inward. In many diseases, therefore, one has a combination of both motor and sensory disturbance. This is practically always true of disorders of the peripheral nerves of which neuritis may be taken as an example.

In the treatment of the sensory conditions much the same is true as already stated regarding motor disturbance. Little can be accomplished if the brain and spinal cord are affected and considerably more if the peripheral nerves are alone involved. In general, however, sensory disturbances are much less amenable to mechanical or other treatment than those involving the motor system. In the application of electricity or massage care must be taken not to adopt extreme measures for the reason that the patient, not being conscious of the manipulation, is naturally unable to appreciate the possible pain of a procedure which otherwise he would be quick to detect.

There is always danger if the skin is broken that it will heal much more slowly than if the sensory nerves were not involved. A particular warning should be given regarding the use of electricity by which burns are occasioned with extreme ease which may be very stubborn in healing.

In certain forms of sensory disorder as, for example, in the disease locomotor ataxia, incoordination results. This is one of the extremely useful fields for the application of physical means of treatment. The coordinative exercises devised by Fraenkel many years ago constitute a most valuable contribution. If skillfully applied, these exercises may greatly decrease the incoordination, which often reaches the point of inability to stand or walk, to the extent that a considerable amount of coordinated movement may be regained. In general the application of physiotherapeutic measures, broadly considered, to incoordination due to disturbance of the nervous system even when centrally involved is not sufficiently appreciated. Here then is an instance in which although no alteration in the pathological changes is to be expected, a definite symptomatic improvement may occur.

The Function of Mentality:—Somehow in the course of evolution the mind developed. Its relation to the brain has from the time when men first began to think been a problem beyond solution and still remains so. It may, however, be accepted as a demonstrated fact that so far as human beings are concerned, mental functions cannot go on without a brain. This being accepted, it follows that alterations in the brain may produce definite changes in mental function and also that thought either normal or disordered may go on without discoverable alteration in the brain substance. The important point from a practical standpoint is to realize that when a patient is conscious he reacts in a definite way to whatever takes place in his body. This fact should be borne in mind in dealing with patients whatever their condition or disease may be. If one is absorbed in any definite form of treatment whether mechanical or otherwise, one is too apt to ignore the mental attitude of the patient as beyond and outside his special interest. This is always a mistake. Whether we are dealing with a paralytic condition or any other organic disturbance of a mechanical sort we should never ignore the patient himself since much of the success of treatment depends upon the cooperation of the person being treated. The first step, therefore, in physiotherapy, as in all other forms of treatment should be to estimate the mental makeup of the patient so far as possible—what his fears and anxieties may be and how far he is either willing or capable of cooperating in efforts toward his betterment or cure.

In this connection it is important to emphasize the fact that the condition known as hysteria may stimulate organic disturbances of almost any character. Spastic contractures, anesthesias, and various alterations of the functions of the body may be and often are due to the disordered mental state to which the term hysteria has been given. It is now generally recognized that the hysterical situations are purely mental in origin although not infrequently apparently organic in result. It becomes, therefore, a matter of the greatest importance and not infrequently of the utmost difficulty to differentiate between conditions due to some definite structural change in the central nervous system and conditions which are ultimately dependent only upon the mental state of the individual concerned. From a practical standpoint, therefore, it is evident that the type of treatment to be applied must differ in these two groups of conditions. Mechanical applications such as braces, plaster casts and similar apparatus if applied to a contracture, hysterical in origin, are practically never helpful and more often than not distinctly detrimental, whereas they might be perfectly applicable to a similarly appearing disturbance due to physical causes. This differentiation, therefore, should always be made, namely, as to whether we are dealing with an organic affection of the types described above, or an hysterical one simulating such disturbances. If certain contractures, anesthesias and general apparent disorders of the nervous system are found to be due to the mental state of the individual, it is obvious that the treatment should be mental rather than physical. It is furthermore always to be borne in mind that certain patients with less pronounced hysterical signs are in such a state of mind that they derive a high degree of satisfaction from their illnesses either consciously or unconsciously and resistance is thereby at once erected against treatment of any sort. This matter of unconscious resistance to cure is rarely recognized by those inexperienced in these matters with the result that much time may be wasted through mechanical methods when the only possible way to relieve the situation is by an appeal to the emotional life of the patient with a search for underlying causes. Such an investigation naturally goes far beyond the scope of the physiotherapist but the recognition of the possibility of such a situation should be remembered particularly in those cases in which faithful and apparently reasonable effort does not lead to satisfactory results. All this goes to show that the whole personality must be studied before an adequate therapy of whatsoever sort can be instituted. Until the mind of the patient is clear of obstructing difficulties and his cooperation complete, disappointment is sure to follow otherwise well devised curative measures.

In conclusion, therefore, it becomes evident that in the broad field of physiotherapy the conscientious student must give time and attention to the nervous system in its various ramifications and must never cease to realize that patients are not only endowed with muscles and nerves but also with a mind which in subtle ways is continually influencing the physical condition.

Basic Principles of the Study of Blood Pressure, Particularly in Relation to the Influence of Physical Measures

By Francis Ashley Faught, M. D., Medical Consultant to the Misericordia Hospital, Philadelphia, Pa.

Read by invitation before the Pennsylvania Physiotherapy Association, December 5, 1931

(Continued from March-April Issue)

THE INFLUENCE OF CERTAIN DISEASED STATES UPON SYSTOLIC BLOOD PRESSURE

In the final analysis, there are comparatively few pathologic conditions that materially influence blood pressure, per se, and still fewer where the variation is characteristic. For example, we may find the same pressure readings in moderately advanced chronic Bright's Disease, as we find in generalized arteriosclerosis, without significant kidney involvement. On the other hand, we may find certain types of kidney disease such as nephrosis, and some of the parenchymatous inflammations, presenting levels differing in no way from simple hypertension. The same may be said of some apparently generalized, fairly well advanced arteriosclerosis. The hardest, most irregular and elongated superficial blood vessels that I have ever encountered occurred in a male of advanced years, whose blood pressure readings were but slightly above his physiologic normal limits; in valvular heart disease, except aortic insufficiency, the blood pressure readings may be normal and are rarely characteristic.

On the other hand, in aortic insufficiency the blood pressure readings are characteristic and often sufficient to make the diagnosis, but even here there are certain limitations due to the fact that similar readings may occur in high grade generalized arteriosclerosis and in hyperthyroidism.

The characteristic blood pressure finding in aortic insufficiency is a slight elevation in systolic pressure, and an extremely low diastolic pressure, often approaching zero, with a resulting immense pulse pressure. This is largely a mechanical effect due to the fact that much of the blood which is expelled at each systole of the heart flows back into the heart during diastole. There is, therefore, no sustained pressure in the large arteries during diastole, hence the extremely low diastolic pressure and extraordinarily large pulse pressure so characteristic of this affection.

THE VALUE OF BLOOD PRESSURE OBSERVATIONS IN DIAGNOSIS AND PROGNOSIS

In neither diagnosis nor prognosis does the actual systolic level necessarily bear any close relation to the seriousness of the situation. A high systolic pressure, in one case, may be carried safely for an indefinite period, while in another, a moderate elevation may be a sign of impending cardiac or cerebral catastrophe.

Broadly speaking, the more nearly the clinical diagnosis approaches pure arteriosclerosis, especially when the arterial change has been slow in developing, the less serious is systolic elevation. Many have observed systolic pressures beyond 200 Mm. Hg. in chronic arteriosclerosis which are well borne for many years, with a minimum of symptoms, or sometimes none at all. On the other hand, apparently trivial but recent and persistent systolic elevations in individuals of apparently good health may be the first sign of a rapidly developing cardio-vascular or cerebral crisis, which will, in spite of every effort to relieve the patient, go on to a rapidly fatal termination.

It is always more valuable to compare the systolic blood pressure level with the diastolic pressure and so bring out the change in pulse pressure, and then correlate these figures to the other clinical findings, as it has already been shown that the diastolic pressure, having greater stability than the systolic, is less subject to the influence of the so-called transitory factors, so that when this is materially altered the diagnostic and prognostic value of this finding is usually of more value than the systolic variation.

We may generalize by stating that in most cases, marked elevations of systolic blood pressure indicates the existence of either degenerative changes in the kidneys, or of general tightening up of the arterial tree, due to fibrous replacement, and calcification of the walls of the blood vessels. Occasionally toxemias of which eclampsia is a characteristic type, will produce sharp, usually temporary elevations in systolic levels. Minor variations which are often enlightening but rarely characteristic, are met in certain types of valvular disease, as in mitral stenosis, in the early stages of heart muscle involvement, also in chronic toxemias, as for example, lead poisoning, in acute poisoning with heavy metals such as bichloride of mercury, and in certain infections as for example—in the secondary stage of syphilis.

The degree of systolic elevation, speaking broadly is a rough measure of the degree of circulatory embarrassment, occurring in a variety of conditions. Therefore, frequently repeated observation of blood pressure is a

valuable guide in following the progress of many diseases and as a means of noting the effect of treatment.

CARDIAC DECOMPENSATION

In decompensation, in addition to the usual clinical signs, we will find the pulse considerably elevated, often irregular and difficult to count; the systolic pressure may be above the normal average for the age of the patient, and there will often be observed apparently two systolic readings due to an absence of either the second or third auscultatory sound phases, or both.

The diastolic pressure will usually be disproportionately high, and the pulse pressure abnormally small, as little as from 15 to 20 Mm. Hg. Circulatory recovery will be shown by a steadying of the pulse and a reduction in its rate. There may, or may not be a change in the systolic level, but the difficulty in its estimation will disappear and this change will be associated with a distinct lowering in diastolic pressure, with a resulting increase in pulse pressure.

THE EFFECT OF PHYSICAL MEASURES

The great value of various forms of physical measures in the management of cardio-vascular conditions, is too well known to require emphasis. The effect of some of them will be briefly enumerated. The physical measures available for the treatment of conditions involving alterations in blood pressure include rest, exercise, massage, hydrotherapy, electrotherapy, diet and venesection.

Rest

It may be of interest to consider for a moment the important place that rest occupies in the treatment of cardio-vascular embarrassment. We sometimes forget that in every case of circulatory embarrassment there is a definite factor of over-exertion which, acting over a longer or shorter period of time, and in greater or lesser degree, has exhausted or at least greatly reduced the reserve of the heart. This overstrain, if not restricted, will result in the condition known as cardiac decompensation or heart failure. In heart failure all effort must cease, in order to permit the inefficient and dilated heart to recover, if possible, some degree of reserve. Ordinarily, the amount of rest will depend upon individual conditions, in extreme cases the term "rest" is not relative, but absolute. No physical activity whatsoever is permitted and nothing done by the patient himself that can be avoided; even change in posture, the lifting of a glass of water, or feeding himself may be sufficient to prevent recovery of the lost heart tone. The duration of such absolute rest will be determined largely by the general condition of the patient. This decision is assisted by regularly repeated observations of the blood pressure and pulse rate.

In the last analysis, etiology is unimportant since it makes little difference whether the condition has been brought about by long continued over-indulgence in alcohol, or by progressive arteriosclerosis of unknown cause, or toxic states, or by degeneration of the heart muscle from a variety of causes. The chief consideration in the treatment of every heart that has lost its reserve, is that having failed in its effort to maintain a circulation adequate to the needs of the body, it must be given rest. I believe that rest, is the most important single therapeutic measure that can be applied to the failing heart, and that in practice it is safer to unduly prolong the rest period than to run the risk of making it too short.

Passive and Active Movements and Exercise

In the treatment of every case of decompensation, the time will come when some variety of effort must be prescribed. This should be begun experimentally at first, during which a careful watch must be kept upon the blood pressure, and on the pulse rate. In the beginning resistance movements are employed to be followed by very light body massage. Later we may permit a gradual change in posture associated with increasing activity by the patient himself, while in bed. As improvement continues he may be permitted to leave the bed, here again it is important to observe the effect of these activities upon the blood pressure and pulse rate.

On the other hand conditions involving the cardio-vascular system may be encountered in which insufficient exercise plays a role. In some of these, subnormal pressures are characteristic. For example, those of poor physique, who are often described as being "constitutionally inferior"; such are frequently benefited by systematic, often fairly active exercise. In contrast to this, we have the active business and professional man approaching middle age, who may present no distinct evidence of cardio-vascular or renal pathology, except a definite hypertension. Here, a vacation or properly prescribed exercise including walking, golf, horseback, and the various gymnastic courses as offered by clubs and commercial organizations may be expected, by relieving nervous tension and improving elimination, to favorably influence the elevated pressure.

Massage

General massage is usually well borne, and often of great value in the treatment of cases showing failing compensation and defective heart tone. Such treatment tends to empty the venous side of the circulation, relieve the left heart of an overload of blood, and dilate the superficial capillaries. It has not been shown that massage of the abdomen, unless unduly vigorous, unfavorably affects circulatory conditions, while massage of the chest and back may directly improve heart muscle tone.

Diet

The former teaching of the value and importance of protein restriction in cardio-vascular and renal cases with elevated blood pressure is now in the discard, since it has been shown that rigid protein restriction unfavorably influences metabolism, by causing emaciation, muscular weakness and anemia. We have now turned our attention more to the importance of a general supervision of diet with the elimination of excesses of all varieties of food, while yet maintaining a maintenance diet which is so necessary to normal nutrition. It has not been shown that there is any relation between excessive protein diet, arteriosclerosis and nephritis.

In the presence of edema, rigid salt restriction and definite carbohydrate reduction is indicated, as it has been shown that such measures are extremely valuable in reducing this serious complication.

Much benefit will be found to follow an equalization in the volume of the usual three meals. In serious cases, the prescribing of four evenly spaced, small well-balanced meals daily will often aid in relieving circulatory embarrassment.

Fluid Intake

Fluid intake should be regulated, since many persons drink insufficient fluids to maintain satisfactory bowel and kidney elimination, while others are habitually large users of water; the former should have their fluid intake brought up to a normal level and the latter have the volume reduced.

Hydrotherapy

Hydrotherapy has a distinct place in the management of many pathologic conditions associated with variations in blood pressure, usually elevations. The primary

effect of the external application of water, either hot or cold, is to cause a slight initial rise in systolic pressure. In the case of the hot bath, this is speedily followed by a reaction resulting in a lowering of the systolic pressure from relaxation of hypertonus of the arterial tree, and a dimunition in peripheral resistance thru dilation of the capillaries.

Cold Baths

The application of cold, as by the cold plunge or cool shower, reduces pulse frequency and increases its volume, but elevates systolic blood pressure. The same effect follows the local application of cold over the precordium. Cold application and cold baths, while they have their use in isolated cases, should be prescribed with great caution in the presence of definitely elevated systolic blood pressure. In cases with marked hypotension, not due to active pulmonary tuberculosis and in the absence of marked exhaustion, as after acute infections, benefit frequently follows the application of cold in the form of the sponge bath, cool tub bath, or the alternate application of the hot and cool shower.

Hot Baths

The immediate effect of a full hot bath from 100 to 108 deg. F. is to increase the pulse rate, lower the systolic pressure and relieve circulatory tension. The temperature of the bath is important, since an excessive application of heat in some cardio-vascular cases may greatly lower systolic pressure and be followed by a dangerous reaction. Warm baths, approximately 98 deg. F. are very useful in the treatment of many nervous cases presenting high systolic pressures, but it should be remembered that the old fashioned sweat bath which was formerly advised in high pressure cases, associated with kidney involvement, has been found to be of more harm than benefit, and should not be employed.

There are other special forms of baths, which have their place in cardio-vascular therapy, which may be relied upon, in selected cases, to favorably influence abnormal blood pressures. You are all familiar with the Nauheim bath and its modifications, also the CO_2 bath and the brine bath.

Electrotherapy

We may for convenience include under this heading, the various forms of electric light baths, which are in reality types of dry hot air baths, the effect of which in a general way is similar to that of the hot water bath, although the tendency to produce active sweating is greater.

The control of the temperature and of the duration of exposure is important since in most heart cases, active diaphoresis is to be avoided.

In recent years, diathermy and autocondensation have become valuable adjuncts to the treatment of conditions associated with high blood pressure, particularly in arteriosclerosis. The application of diathermy has been shown to produce a sharp and often lasting reduction in systolic pressure accompanied by a narrowing of pulse pressure, and this effect seems to occur irrespective of whether the elevation is primarily due to chronic nephritis or arteriosclerosis, although the greater benefit has been shown to occur in arteriosclerosis.

Venesection

Careful observation guided by the sphygmomanometer has not proven that this measure is of much value as a means of permanently influencing chronically elevated blood pressure but where sudden intense venous engorgement arises in a case of hypertensive cardio-vascular disease, venesection may be life-saving; in which role it is purely an emergency measure, to be followed by other methods of treatment. I would caution against the intermittent withdrawal of blood, in the average high blood pressure case, because it often defeats its purpose, by further concentrating an already concentrated blood. The most that can be expected from venesection, is a temporary moderate reduction in systolic pressure. In this connection Miller has shown that the removal of from 500 to 600 cc of blood will cause a definite reduction in systolic pressure, which is promptly followed by a return to the original level, often within two hours. The benefit derived from this measure in chronic high pressure cases, may be prolonged if immediately followed by a replacement of fluid by either the intravenous or the subcutaneous routes.

5006 Spruce Street.

The Eugene S. Gilmore Memorial Foundation

The Eugene S. Gilmore Memorial Foundation has been created by the friends and associates of Mr. Gilmore to perpetuate the memory of him who gave the greater part of his active life to hospital work.

During the past twenty-five years he was the Superintendent of Wesley Memorial Hospital. He was also past President of the American Hospital Association and its Senior Trustee. Mr. Gilmore had many demands made on his time but was a frequent contributor to the literature on subjects dealing with hospital management.

The purpose of the Foundation is to create a Fund, the income of which will be used in establishing scholarships for the graduates of Wesley Memorial Hospital School of Nursing. The Fund will also provide for a tablet or medallion which will occupy a suitable place in the present hospital with provisions made for placing it in the new WESLEY MEMORIAL HOSPITAL when that is completed.

Subscriptions are being received by Dr. Mark T. Goldstein, the Treasurer of the Foundation.

Derangements of the Semilunar Cartilages Based on a Study of 388 Operative Cases*

By W. Russell MacAusland, M.D., Boston, Mass.

From the MacAusland Orthopedic Clinics

In American medical literature there is a noticeable lack of contribution devoted to derangements of the semilunar cartilages. To be sure, the general field of internal derangements of the knee-joint, embracing pathology of the semilunar cartilages, fat-pads, synovial membrane, and the joint surfaces with their ligamentous structures, has been discussed in numerous articles, but the reports pertaining to the menisci have been comparatively few. This paucity of data gave me the incentive to compile the derangements that had been treated in our clinics. From 1910 until the present time the operative cases have numbered nearly 400. The purpose of this article is to present a study of derangements based upon this series of cases, and to correlate the clinical findings, the pathology, and the end-results.

In this study I have been greatly impressed with the frequent occurrence of errors in diagnosis and treatment of mild joint injuries. There seems to be a tendency on the part of many physicians to regard a slight damage to the meniscus as too trivial for treatment. As a result, the joint is left in a weakened condition, exposing it to the development of further symptoms that may become a potential danger to the function of the joint. In this paper, particular emphasis will be placed upon the recognition and treatment of mild injuries.

Etiology.—There are several factors that may predispose injury to the cartilage. An individual whose ligamentous and capsular structures are in a lax condition as the result of an occupational strain or synovial effusion is more susceptible to cartilage injury. (It is strange, however, that healthy persons whose ligaments and muscles are in perfect tone are affected more often.) Static disturbances due to flat or pronated feet, or due to knock-knee that leads to the stretching of the inner section of the capsule and the internal lateral ligament, are potential factors. Some individuals may have cartilages with weak attachments, or the muscles and tendons surrounding the joint may not be in good tone.

The immediate etiological factor in the majority of cases is trauma. When one considers that the knee-joint is relatively unprotected by soft parts, and when one considers that the joint acts as a fulcrum for the two longest levers of the body, it seems remarkable that injury is not more common. By far the greater number of derangements is due to indirect trauma, as might be expected in view of the tremendous strain upon the ligaments and articular surfaces, amounting, if calculated, to thousands of pounds. The most common type of injury is a wrench or inward twist of the femur when the knee is flexed, the leg abducted, and the foot in a fixed position. Such a movement is often made in dodging or running, or in rising suddenly from a squat position. Consequently, trauma is frequent among workers, and among athletes who engage in strenuous forms of exercises.

The primary injury in many cases is mild, resulting simply in a tearing or loosening of the cartilage. In such cases, the disability is usually slight. The treatment of these mild injuries should not be neglected, however, for once derangement has taken place, recurrence with acute symptoms is common.

Other recognized causes, but less commonly seen, are direct trauma and disease. Cartilage lesions due to direct injury are associated with severe trauma, such as a fracture of the patella. In cases due to disease, which may be either subacute or chronic in nature, diagnosis may be difficult because of the obscurity of the symptoms.

Age, Sex, and Joint Cartilage Involvement.—Derangements of the cartilage are most common in young people, that is, individuals between the ages of twenty-one and thirty. Injuries do occur later in life as well as before adolescence, but these cases are rarer. The age distribution in my reported series ranged from eight to sixty-six years. The majority of the patients were between the ages of twenty-one and thirty, the period in life when an individual is most active and at the height of his physical development. The ages between eleven and twenty years were next in frequency of occurrence.

The injury is much more common among men than women, a predominance that one expects to find in view of man's participation in athletics and in the more dangerous occupations. In the reported series, approximately 65 per cent. of the cases were males. Other operators have reported about the same proportion in their series.

The joints affected are usually about evenly distributed between the right and left. In our series there was only one more case of involvement of the left knee than of the right.

Lesions of the internal semilunar cartilage are far more common than injuries of the external meniscus, a predominance that operators have sought to explain either on the anatomical variations in the two cartilages, or upon a physiological basis.

*This article is printed in complete form in ANNALS OF SURGERY, March, 1931.

FIG. 1—FRACTURED SEMILUNAR CARTILAGE WITH COMPLETE DETACHMENT EXCEPT AT THE POSTERIOR END.

FIG. 2—TRANSVERSE FRACTURE OF THE CARTILAGE.

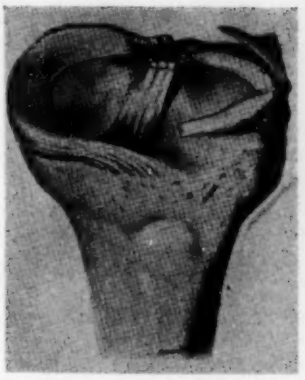

FIG. 3—LONGITUDINAL TEAR WITH DETACHMENT OF BOTH EXTREMITIES.

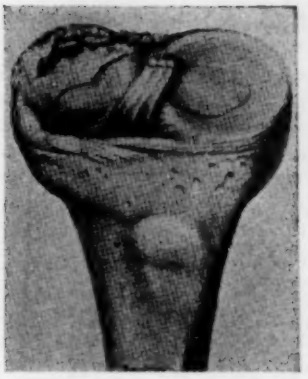

FIG. 4—LONGITUDINAL TEAR IN THE SEMILUNAR CARTILAGE.

Surgical Pathology.—There is a wide variation in the pathology of the cartilages. The types of injuries that it has been possible to determine may be classified as follows:

(1) Hypermobile cartilage
(2) Fractured cartilage
  (a) Type
    longitudinal
    transverse or oblique
    combination of transverse and longitudinal
    bucket-handle
  (b) Site
    anterior end
    posterior end
    middle part
    periphery
(3) Totally avulsed cartilage
(4) Fractures and dislocations

Some of the various types of cartilage fractures found upon opening the joint are illustrated in Figs. 1, 2, 3, and 4.

Attempts have been made to designate the relative frequency of each injury, but such a classification is almost impossible. In Martin's[3] series, definite fractures predominated; in Fisher's[2] series, the longitudinal fractures held first place, and detachment of the anterior horn and obvious fracture were next in frequency. In our series, the hypermobile cartilage held a prominent place. There is a possibility that the hypermobile meniscus occupies the most prominent place in cartilage pathology, but owing to the mildness of the symptoms following a slight lesion, the joint does not come to operation until a later injury produces more extreme pathology. In severe injuries, the bucket-handle type of fracture is most commonly seen.

In addition to the specific injury, the cartilage may be atrophied, thickened, calcified, fibrous or nodular. In some cases, it is difficult to discern the cartilage, so changed is its structure, while in other joints there may be no trace of the meniscus. Loose bodies due to the breaking away of parts of the cartilage may be present. Occasionally, a case is seen in which the cartilage has an apparently normal appearance. Henderson,[8] in recording ninety-eight cases of cartilage derangement, mentioned eighteen instances in which, except for a slight mobility of the capsule, there was no appreciable change despite the presence of the usual symptoms.

The true pathology does not always coincide with the symptoms, that is, intermittent attacks following a fractured cartilage may be mild, whereas a simple hypermobile cartilage may cause severe symptoms. Occasionally, the symptoms may indicate an injury of the internal cartilage, but upon exploration this meniscus is found in perfect condition, and the external cartilage, on the contrary, is deranged. In a certain proportion of cases, the symptoms are somewhat indicative of the pathology. For instance, a sense of weakness is the predominating symptom in the presence of the hypermobile type of cartilage or in cases of loosening of an extremity. In detachments of the cartilage, slipping and sudden insecurity are the predominating signs.

The Hypermobile Cartilage.—The hypermobile cartilage may be an entity in itself, although it is possible that in many of these cases a marginal fracture exists, but is not observed. The abnormal mobility of the cartilage is the result of a slight injury that loosens the meniscus from its peripheral attachments. If dislocation takes place, the cartilage usually moves toward the centre of the joint, although, occasionally, a luxation toward the periphery is seen. The hypermobile cartilage is common among young girls, occurring as the result of a twist or wrench without history of further injury. The symptoms following the initial trauma are mild, and usually there is no locking of the joint. In this type it is particularly important to immobilize the knee-joint to provide an opportunity for repair; otherwise, the slight hypermobility may be the beginning of more extensive pathology in the knee. If treatment is neglected, as often happens because the patient is not seriously disabled, recovery takes place with the cartilage in a loosened condition. A subsequent injury or slipping causes increased hypermobility and the cartilage may be caught between the articular surfaces. With each recurrent slip or pinch, the cartilage swells, thereby becoming more susceptible to further pathology. Total avulsion is not unknown in these cases.

In long-standing cases of a hypermobile cartilage, there are definite evidences of continued local irritation due to the constant rubbing of the meniscus. Villous changes may be felt in the capsule, the edges of the femur may be thinner, sharper, and flatter than normal, or actual hypertrophic changes may be present throughout the entire knee.

Fractures.—A fracture, tear, or split of the cartilage is a common lesion. It may be longitudinal, transverse or oblique, a combination of the longitudinal and transverse, or the so-called bucket-handle fracture. The tear may occur in the anterior end, the posterior end, the middle part, or along the margin of the cartilage. When the meniscus is torn loose at one of its attachments, or when it is torn across, one fragment dislocates. In old-standing luxations the torn ends of the cartilage may become atrophied, or, in an occasional case, thinned.

The split occurs more frequently in the anterior part

of the cartilage than elsewhere. If the peripheral attachment is also ruptured, it is not unusual to find a part of the inner edge of the anterior extremity of the cartilage projecting as a tag toward the centre of the joint. The cartilage is usually displaced inward, leaving a noticeable gap, which can be felt on palpation. Only rarely does the anterior tip displace outward or buckle backward. The tear is followed by symptoms of "catching" or "giving way," even if the cartilage still remains attached at its middle part. The normal cartilage thrust cannot be felt upon examination.

An isolated fracture of the posterior end is rare. It may occur in connection with actual separation of the mid-portion of the cartilage or in total avulsion of the meniscus. Fisher,[7] in his description of the production of a posterior split or displacement, refers to Lang's theory. The latter is of the opinion that during forcible external rotation of the femur upon a fixed tibia, combined with flexion, the posterior part of the internal condyle sweeps across the posterior end of the cartilage, and if the flexion is extreme, the semilunar may be split or detached. Tenney[4] has shown that, in forcible abduction of the leg, the upper attachments of the internal lateral ligament may be ruptured, and the posterior part of the internal condyle slip over the posterior end of the semilunar and roll up the cartilage.

Fractures of the middle section of the cartilage are not uncommon. In such cases the cartilage often folds over on itself, bringing the razor edge away from the crucials. There is always a definite history of slipping, followed by almost total disability, and, in case of displacement, by flexion deformity.

The Totally Avulsed Cartilage.—A complete tearing of the cartilage from its attachments is not common. It is produced only by a very severe trauma.

Associated Pathology.—Early Changes.—Immediately following the injury there is extravasation of synovial fluid, which gradually grows thicker and more stringy. Free blood is present in the joint. The displaced meniscus always causes a synovitis.

Later Changes.—The synovial membrane becomes more fibrotic with each attack. The capsular ligaments are thickened as in any chronic joint process. There is usually atrophy of the quadriceps group. Wallace and Permar,[8] who made a careful study of the pathology in seventy-one cases of derangements in which arthrotomies had been performed, found proliferative inflammatory changes in the synovial membrane, which had given rise to pannus or a granulation tissue over the articular cartilage. In long-standing cases this cartilage had become eroded or even destroyed under the heavy pannus. Wallace and Permar also found that microscopically there was marked thickening of the connective tissue, with a large increase in the size and number of the small vessels, especially the capillaries. As to the fluid, there were quantities present in old-standing cases, of a serous, yellow, brown, or bloody character. Further, the fat pads showed much congestion, thickening, and induration. The fat tissue was compressed and atrophic as the result of marked fibrosis. In chronic cases the infrapatellar fat pad was enlarged, œdematous, and hæmorrhagic.

Occasionally one sees small villi and fatty tabs attached to the menisci anteriorly. These tabs seem to be parts of the cartilage which have been stripped off, but not totally detached, and which have become hypertrophied. Pinching of these tabs causes sudden pain. If any bone or ligamentous damage was associated with the original injury, loose bodies may be found.

Not infrequently an arthritic process is associated with the deranged meniscus. The presence of a local hypertrophic arthritis in one knee-joint following a history of trauma suggests a cartilage injury. Hypertrophic changes take place at the point of irritation and are recognized by the prominent ridges, thinned cartilage on the bony surfaces, and a flattened appearance of the condyles and tibial tuberosities. Occasionally the changes are associated with loose bodies and hypertrophic fringes. These changes may become so marked that joint symptoms persist even after the removal of the cartilage.

Symptoms of Cartilage Pathology.—At the time of injury the patient always experiences severe pain. In addition, there is often a sensation of something giving way in the joint, and a definite click may be audible. In early teaching, locking was considered to be the most important diagnostic sign of cartilage pathology, but it is now clear that this clinical manifestation occurs with much less frequency. In our series locking was present in less than one-third of the cases. It is always present when fracture-displacement occurs. There is considerable effusion whether locking is present or not. Local tenderness is always present. In general, the symptoms resemble those of a sprain.

Following the initial trauma, the symptoms persist for several weeks. The acute pain passes away soon after the injury, leaving the joint aching and sore. Frequently there is pain in the region of the hamstrings and at the top of the patella, but the presence of this pain in no way indicates the extent of the damage to the cartilage. If the effusion is very marked, pain is present, but usually the effusion subsides in the course of two weeks.

The initial attack may be followed by others, some slight, some grave in character. While the recurrent attacks tend to be less severe than the primary one, conversely, they occur from only slight twists of the knee. Definite symptoms of pain, effusion, tenderness, and weakness accompany each attack. The effusion in repeated attacks is less and may persist for only a few days, but this intermittent effusion permanently damages the capsule and weakens the joint. If locking takes place in the subsequent attacks, it is usually transitory, and the patient soon learns to straighten the knee by manipulation. An individual experiencing recurrent attacks suffers intensely from the sense of fear that "something will give way in the knee," and, if the patient is young, he is deprived of the pleasure of participating in sports.

Prognosis.—Three factors influence the prognosis: the number and severity of the attacks, the presence of arthritic changes, and the age of the patient. The average case, if treated properly following the initial injury, either by conservative or by operative measures as the case requires, obtains a resulting joint that is stable and painless without any restriction of movement. This is true of the adolescent case, the adult, or the young child. If a slight weakness or tendency to slipping persists in these cases that are treated early, it is probably secondary to a weak quadriceps.

In a long-standing case, the prognosis following operative removal of the cartilage must be somewhat guarded. The outcome from operation must of necessity be questionable in long-standing cases in which the meniscus is badly torn or comminuted. If the ligaments are relaxed as the result of repeated effusions, operation may restore motion to the joint, but instability persists. In any long-standing derangement, and particularly in those with numerous and severe attacks, arthritic or periarthritic changes take place, regardless of the age of the patient. It is impossible to predict an excellent result in such cases, for the removal of the cartilage will not overcome the arthritic changes. However, many of these neglected cases will be improved by the removal of the me-

chanical defect, and some functional improvement may be expected.

In elderly cases in which the cartilage changes are often secondary to a local arthritis, the prognosis is poor. Usually these patients are undernourished, and the arthritic process involves several joints. Some type of protective apparatus is the best form of treatment.

In our series of cases, in some of which operation was performed following the primary injury and in others following repeated attacks, satisfactory results were obtained in about 91 per cent. Motion and functional use were regained. In the few instances in which there was a recurrence of symptoms, the cause could not be attributed to the cartilage pathology, but rather to the presence of some other lesion, such as a loose body, which was overlooked at operation.

Cases in which a definite diagnosis is made and operation advised, but refused by the patient, often develop severe hypertrophic changes in later life. In view of this danger, the importance of early operation is to be appreciated.

Treatment.—The nature of the treatment depends in the average case upon whether the attack is the initial or a recurrent one. The primary attack, if slight and accompanied by no mechanical changes, can often be treated satisfactorily by conservative measures. Severe initial injuries, or recurrent cases presenting a definite history of injury and typical symptoms of an acute nature, call for operative interference.

Conservative Treatment.—Subsequent to an injury, the knee, if not locked, should be immobilized in extension to prevent all movement. If necessary, fluid can be aspirated. The duration of the period of immobilization varies according to the severity of the injury. In the average case it is three weeks. This procedure is imperative regardless of how slight the injury or how mild the symptoms. Very often a blow or twist will cause only slight disability and there may not even be fluid in the joint. Unfortunately, the treatment of these slight injuries is frequently disregarded.

When locking has occurred, reduction of the displaced cartilage followed by immobilization is the routine procedure. The displacement is easily recognized by the flexed position of the knee and the presence of pain in the region of the cartilage on any attempt at forced extension. Reduction should be made as early as possible before repair tissue has organized and before the cartilage has undergone changes in shape from pressure.

The majority of primary cases of the hypermobile type respond to this treatment. The fractured cartilage eventually comes to operative treatment.

Operative Treatment.—Indications.—Following an initial attack that has left the joint locked in flexion, which cannot be reduced by manipulation, removal of the cartilage by operation is necessary.

Operation is the only means of cure in recurrent cases presenting a definite history of injury followed, upon slight provocation, by an intermittent return of the symptoms of pain, slipping, and tenderness. A chronic or recurrent synovitis is indicative of a pathological change within the joint. Failure to remove the cartilage in these cases not only leaves the patient physically handicapped, but there is the probability that the presence of this derangement will lead to joint changes. (See section on "Prognosis.")

In the presence of arthritic complications, the advisability of operation must be considered carefully, for arthrotomy is not warranted if the patient will not receive benefit. Several influencing factors are the age of the patient, the location of the arthritic lesion, that is, whether monoarticular or generalized, the stage of the infection, and the part played by the cartilage derangement and the arthritic element in producing the present symptoms. If the changes are localized and the disease is progressing, removal of the source of irritation is imperative.

In a certain proportion of cases in which it is impossible to determine pathology sufficient to cause the existing symptoms, the advisability of exploratory arthrotomy must be considered. One must weigh carefully the symptom complex and the physical manifestations, and one must appreciate the seriousness of irritative changes of mechanical origin.

Technique.—The operative treatment consists of the removal of the cartilage, the technique of which is given in my article on Derangements of the Semilunar Cartilages, published in Annals of Surgery, March, 1931.

Post-operative treatment.—In past years, it has been our custom to secure immobilization by means of a plaster bandage, which was worn for a period of two weeks. Complete immobilization has a certain advantage as far as the patient is concerned in that the pain is lessened. Of late, we are inclined to believe that this period of immobilization in a plaster bandage predisposes the formation of adhesions. To avoid this complication, we are applying a snugly fitted voluminous flannel bandage from the toes to the hip with considerable reinforcement about the knee-joint. This bandage holds the knee snugly, and by producing compression prevents any extravasation of fluid and hæmorrhage subsequent to the operation. In addition, the bandage, as it begins to loosen, allows a little freedom of motion during the first week after the operation. Our experience with this procedure thus far seems to bear out our view that it is preferable to complete post-operative immobilization.

The duration of the convalescence depends entirely upon the pathology. Recovery from a hypermobile or torn cartilage that has been treated promptly takes place within a few weeks. Arthritic cases, on the other hand, recover more slowly. In the simple case the compression bandage is worn for ten days or two weeks. As soon as the temperature is normal and the patient is comfortable, he may begin to walk with crutches. At the end of two weeks, hot fomentations and gentle active movements are carried out daily, and speed up the convalescence. In three weeks the patient should be able to bend his knee to a right angle. Massage of the thigh and calf should be instituted as early as possible. In eight weeks most patients are able to resume moderate activity. Other patients recover much sooner. I have known a juggler to return to the circus at the end of three weeks. Convalescence is likely to be slow in industrial cases, as these patients may be influenced by the fact that they are drawing compensation as long as they are disabled, and they are, therefore, loath to use their muscles from fear of pain.

Correction of a talipes valgus or a weak foot should be practised as a routine procedure, following the removal of the cartilage, in order to prevent strain on the internal lateral ligament. A lift on the inner side of the heel and sole may be used for this purpose.

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SUMMARY CHART OF CASES

No. of cases	Sex	Age	Knee involved	Cartilage involved	Etiology	Pathology	Time between onset and operation	Time since operation	End-results
388	*Males* 252	*8-10 yrs.* 2	*Right* 181	*Internal* 276	*Trauma* 311	*Hypermobile* 146	*Days* 6 cases	*5-10 mos.* 41 cases	*From patient's viewpoint*
	Females 136	*11-20 yrs.* 81	*Left* 182	*External* 38	*Disease* 5	*Fractured* 149	*Weeks* 39 cases	*1-10 yrs.* 223 cases	Satisfactory 230 Partly satisfactory 28 Unsatisfactory 29 Unrecorded 101
		21-30 yrs. 112		*Both* 47	*Cause Unknown* 39	*Dislocated* 50	*Months* 133 cases	*11-25 yrs.* 55 cases	
		31-40 yrs. 62				*Totally avulsed* 5	*Years* 164 cases		*From surgeon's viewpoint*
		41-50 yrs. 49							Satisfactory 262 Partly satisfactory 6
		51-60 yrs. 35							Unclassified 13 Poor 14
		60-70 yrs. 8							Unrecorded 93
		Unrecorded 39	*Unrecorded* 26	*Unrecorded* 27	*Unrecorded* 34	*Unrecorded* 85	*Unrecorded* 46	*Unrecorded* 69	

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Radical Electrosurgical Mastectomies. SUTTEN H. GROFF, M.D.,

(Continued on page 158)

Position in Physical Therapy

By K. G. Hansson, M.D., New York, N. Y.

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Papers on physical therapy by very able men often suffer from the attempt of crowding more into them than the average listener can follow and appreciate. This paper will confine itself to a definite, small aspect of the subject and intends to discuss the most favorable position of the part under treatment by physical measures.

Having had most of my experience in orthopedic and traumatic hospitals, I am just trying to pass on what I have learned from bitter experience. It is nothing new but it has not been emphasized in its relation to physical therapeutics. For practical purposes our problem is narrowed down to the question: In what position should we treat a drop wrist, pathology of the deltoid m., the posterior trunk m., the glutteus max. or medius, the extensors of the knee or extensors of the foot, etc., and the reason for these most favorable positions. If the question of position is disregarded in these pathologies, we get deformities induced by either the contraction of the antagonists or by gravity. When we visualize a patient showing all these deformities we will have a body in nearly the same position as that of the fetus, i. e., flexion of the fingers, wrists and elbows; adduction and flexion of the shoulders and the lower extremities show adduction-flexion of the hips; flexion of the knees and feet. Head and trunk show a segment of a circle. This fetal position is approached in many pathologies and we must be on guard to prevent them. It is easier to prevent them than to correct them—once they have developed.

Let us first divide our neuro-muscular system in a concentric group, including all m. producing movements toward the center of the body and an excentric group which includes the m. performing movements away from the body. In general, we may say that the concentric group is antagonistic to the excentric group. This antagonistic action is maintained by a very delicate neuromuscular action that has a practical expression in the m. tonus. This m. tonus maintains a muscular tension which is necessary for the smooth working of our movements. In addition to this antagonistic action we have a synergistic action, i. e., a contraction impulse to a flexor m. is always preceded by a relaxing impulse to its extensor. The workings of this delicate function are not completely understood. A German anatomist in 1910 published his findings of both medullated and non-medullated nerves which ended in different ways among the m. fibers. Modern physiology teaches us that the striated m. have two kinds of fibers: the red rich in sarkoplasm and the white ones—rich in fibres. The former contract more slowly and prevent too rapid relaxation after contraction. Mosso had already in 1904 differentiated between the rapid m. twitchings and the more leisurely m. tonus. This instrinsic pattern of a muscle is controlled by both the C. N. S. and the sympathetic nervous system. Continuous N. impulses are necessary to maintain a normal physiology in a m., both directly on the m. fibers and indirectly on the blood supply. These N. impulses will produce what we call m. tonus. From experience these impulses produce their optimum effect when the muscle is in mid state, i. e., when there is equal muscular tension between flexors and extensors. This m. tonus is the first thing lost when a muscle is paralyzed and the smooth workings of the unaffected muscles are upset. Secondary contractures of these unaffected muscles will produce a shortening of all the soft tissue about the joint involving the connective tissue, the ligaments and the capsule. This is what happens on the contracted side. On the opposite side we will have overstretching of the muscles and elongation of connective tissue, ligaments and capsule.

Von Tilman and Kremer called attention to the fact that over-stretching can produce atrophy. Each m. has a certain elasticity and Mosso has shown that, after a muscle has been stretched, it will retract but does not return to its original length. Till man proved that a muscle can be damaged if by stretching it is prevented from returning to its normal resting position over a certain length of time. Such a muscle will soon show deterioration. There is a diminution of the primitive striae with gradual disappearance of the striation and, finally, gradual complete disintegration of the m. fibers. The change of muscle tissue into connective tissue is a consequence of failing functional stimulation and less differentiated tissue takes the place of more highly specialized structures.

Even the passing stretching that takes place at rest or when a muscle is spared will produce the same deteriorating effect on the muscle tissue. In bedfast patients in late stages the contractures are in positions beyond the rest position. It is a well-known fact that such muscles as the extensors of the wrist and fingers, the deltoid m., the glutei m., the quadriceps and the extensors of the foot and toes atrophy much more rapidly than their antagonists. Several reasons for this have been advanced.

Comparative physiology will teach us that excentric

muscles are relatively younger in their function. Concentric movements are older in their function; they have been developed earlier and their structure is therefore stronger and more resistant in every respect. We only have to compare the flexors and extensors in the forearm and the adductors and abductors in the shoulder and hip. This, we call phylogenesis. It is not confined only to the muscular tissues. It is undoubtedly true—even of the nerve supply. Extensors and abductors are supplied by the nerves from the posterior nerve roots which are branches from the main nerve trunks that seem to continue into the ventral branch supplying the flexors and adductors. If this is the reason for the difference in electrical irritability I am not aware of it. I have, however, proved to my own satisfaction that less current is necessary to produce a contraction in flexors and adductors than in corresponding extensors and abductors. This can easily be done by the Jones condenser set.

Merk Jansen suggested that the stronger fascia found in excentric muscles will interfere with the circulation to the muscles when over-stretched. It is rational to believe that a continued stretching will diminish the lumen of the blood vessels and produce circulatory changes.

Furthermore, the maximum and minimum length of the concentric and excentric muscles indicates that the excentric muscles undergo more physiological stretching than their antagonists.

Thus:

SUBJECT I	LENGTH IN INCHES			
Muscle	*Normal*	*Min.*	*Max.*	*Diff.*
Deltoid m.	6	4	6,25	2,25
Ext. fingers	18,25	17,25	19,75	2,50
Triceps m.	12	11,50	13,50	2
Erector spines	19,50	18	23	5
Glut. max.	10,25	9,75	15	5,25
Quadriceps	18	17,50	19,50	2
Ext. toes	21,25	19,25	22,75	3,50
SUBJECT II				
	5,50	4	5,75	1,75
	18	17	20	3
	12	11,75	13,75	2
	18,25	16	20,50	4,50
	10,25	9,50	14,75	5,25
	18	17,50	19,25	1,75
	21,25	19,25	22	2,75
SUBJECT III				
	5,75	4,25	6	1,75
	17,50	16,25	17,75	1,50
	11,75	10,25	12,75	2,50
	20	18,50	22	3,50
	9	8,75	11,75	3
	13,50	12,25	15,50	3,25
	22	21,50	23	1,50

GRAVITY

It is true that gravity exerts most of its effort on the excentric group of muscles. Thus, we have in addition to all the previous disadvantages of this group of muscles the constant pull of gravitation. Therefore, whatever the anatomy and physiology may be of concentric and excentric muscles, the always-present gravity must be considered. A beautiful example of this is in the treatment of facial paralysis. The application of heat, electrical contraction, massage and mirror exercises I believe is only secondary to the support of the muscles innervated by the middle and lower branch of the facial nerve. This can be done by adhesive tape from the corner of the mouth to the ear. Better yet is a padded fishhook which is held by a pincenez holder on the ear.

When we realize that the physical therapy treatment takes less than an hour out of 24 or 48 hours the importance of the position of the relaxed tissue between treatment assumes greater significance.

DROP WRIST

The drop wrist and drop foot are two rather common deformities which we are called on to treat. It is of interest to speculate as to the predisposed nature of the structures involved, especially the musculo-spiral N. and the peroneal N. in particular, the superficial branch of the latter. The toxic properties of alcohol, lead and arsenic seem to select these nerves and the drop wrist often helps in the diagnosis of these poisons. I have been unable to find out any reason for this specific selection and, to say that the phylogenetic age is responsible, is only of academic interest.

In addition to such drop wrist from toxins, we have the paralytic drop wrist, anterior poliomyelitis being the most common pathological cause.

The traumatic peripheral nerve lesion of the musculo-spiral nerve producing a drop wrist is familiar to us all. In this connection I should like to ask you if anyone has had a similar experience as the following: In 1929 I was called in consultation to see a college boy who had received a fracture of his right humerus—middle third. It had been produced during training in hammer throwing. The weight had slipped and landed on this patient's arm fracturing the humerus. He showed clinically complete paralysis of musculo-spiral N. and three weeks after the accident, he showed a reaction of degeneration. The surgeon, therefore, wanted to do an open reduction and, at the same time inspect the nerve. The consulting neurologist found no disturbance of sensation of the upper extremity and took the responsibility for a closed reduction. This was done and I saw the patient six months afterward with no signs of paralysis and with the fracture healed. It goes to show that we do not know much about the nerve lesions as yet, and it taught me to be more humble in electro diagnosis. This patient had his arm and hand placed in the proper position with wrist and fingers in extension. This position is absolutely necessary when we treat any weakness of extensors of wrist and fingers. The splint should place both the wrist and the fingers in extension while treatment is instituted. The flexors of the wrist and the fingers are very strong compared to the extensors and undergo contraction early.

EPICONDYLITIS

In 1929 I brought out the importance of treating this pathological entity in such a position that the extensors coming off ext. condyle were relaxed for three to four weeks, while undergoing the proper physical therapeutic treatment. Before using the cocked up splint my results were poor; they have been uniformly good since I combined my treatment with the most favorable position.

SHOULDER

Of all the muscles in the body the deltoid muscle probably is at the greatest disadvantage, both as to the mechanics, phylogenesis and gravity.

This disadavantage is shown early in life. In Erbs' palsy, it is most important to place the baby's upper extremity in the 90-90 position with the forearm supinated and fingers extended.

To prevent deformities in poliomyelitis, an early abduction splint is necessary to give maximum result in the muscle-reeducation treatment.

In all adult traumatism or disease about the shoulder, we must guard against th loss of abduction. I had once the opportunity of seeing two parallel cases of dislocation of the head of the humerus. One was treated in an abduction splint and was well in six weeks. The other one I treated without a splint and

it took him six months—on exactly the same treatment. One fact that I have not seen emphasized in textbooks is the common occurrence of temporary paralysis of the circumflex nerve complicating shoulder dislocations. The abduction of the shoulder in treating fractures about this joint is generally recognized. I believe that it ought to be made a rule in the physical therapy treatment of the shoulder wherever there is the slightest danger of losing the abduction.

NECK

The posterior neck muscle is often the site of occupational or static myositis. This cannot be treated successfully unless we realize the mechanics of the head and neck.

In quadruped animals, the head is held up by the strong ligamentum nuchae and powerful neck muscles. In the human biped position, the head is balanced on the cervical spine and the neck muscles act like guy ropes, the ligamentum nuchae being insignificant. If we hold our head like a quadruped, as we so often do, in many occupations and also in reading and writing, a great load is carried by the posterior neck muscles giving us the proverbial pain in the neck. Such a myositis may be temporarily relieved by heat, massage, static wave current, etc., but the permanent relief will only come with correction of the faulty mechanics. We must teach the patient to carry the weight of the head on the spine. The spine is for weight-bearing and the muscles are for balance and motion.

SHOULDER GIRDLE BRACE

The wing scapula is most often part of general poor body mechanics, although we do find it as a single symptom. Whether the etiology is anterior poliomyelitis or an expression of pseudo-hypertrophic muscular dystrophy, I do not know. The pathology is either a paralysis of the long, thoracic N., or the respiratory N. of Bell, or muscular degeneration of the serratus magnus m., the trapezius or rhomboid m. The resulting deformity consists in the flaring out of the scapula and a displacement of the scapula laterally away from the posterior spinous processes. The conservative treatment of this deformity should include a brace releasing the tension of the above muscles. Such a brace consists of a figure eight strap around the shoulders, crossed in the back and connected with a small abdominal strap.

BACK

No other part of the body suffers so much from treatment and so much from lack of diagnosis as the back and especially the lower back. I am not going to burden you with a description of possible pathologies which may produce low back pain. Any of the structures of this part of the body may be at fault. The skeleton, muscles, nerves, ligaments, abdominal or pelvic organs may be the cause producing symptoms of low back pain. I shall, however, emphasize two things that should form the background in our dealings with this complex problem.

The first one concerns the evolutionary changes in anatomy and physiology of the lubo-sacral region. In assuming the erect position a 90 degree extension took place between the lower extermities and the trunk. Some of this change occurred in the hip joint and some in the lumbar region. This anatomical change was not confined to the skeleton but involved all the structures and organs to be found about the pelvis and the abdominal and lumbar region. Thereby, a weak structure was prepared for the increased activity that the lumbar spine had to take over. A mechanically weakened structure was exposed to an increase in motion. Such is the anatomical and physiological background for low back pain.

The second point I would like to bring out is the logical sequence of the first one. The importance of pain must be realized. I believe that pain has a physiological part to play. Pain, therefore, although only a symptom, must be respected. The sensation of pain is probably the most important help a doctor has in his diagnosis. I also believe it is safe to make the following general statement: that any pain brought on by overactivity, either qualitatively or quantitatively, should be treated with rest. The only complete rest for the back is the recumbent position in the quadruped attitude of spine, hips and knees. This can only be accomplished on a hard bed. This prevents the sagging under the heaviest part of the body—which is the pelvis and hips. The hips are flexed to prevent the pulling of the ilio-psoas on the lumbar spine and to relax the quadriceps muscles. This position cannot be assumed without flexing the knees. If this advice were taken literally, half the population would be spending their time in bed. This is not always practical and therefore we must do the next best thing—which is incomplete rest or support. For the whole back we use a spinal brace consisting of two steel uprights running parallel to the spine and resting on scapula above and on the pelvis below. These steels are the skeletal support of a corset. The supporting elastic bands should run parallel to the different muscle layers making up the abdominal wall.

The pelvic support consists of a canvas belt placed just below the crest of the ilium, extending from the pubis to just below the umbilicus in front and laced in the back over the sacrum.

With such support we will register better result with our physical therapy treatments in these most difficult cases of back pathology—which are probably the most trying patients we have to treat, with the possible exception of our arthritis patients.

THE QUADRICEPS

The two muscles in the body which are the most susceptible ones to the atrophy of non-use are the quadriceps and the deltoid muscles. In any pathology of the thigh or about the knee joint, the quadriceps muscle must always be watched because atrophy may set in after a week to ten days. Extension is the most important position in the knee and it therefore becomes necessary to start very early the treatment of the quadriceps to maintain its tone. It is the vastus medius which is responsible for the last few degrees of extension. This muscle is often neglected in the treatment resulting in a wabbly knee and necessitating the locking of the knee in walking. A support is rarely needed because overstretching of the quadriceps seldom occurs and full extension of the knee in standing, walking, sitting or lying is easy to assume.

DROP FOOT

As mentioned before, we have in the superficial peroneal nerve or external popliteal nerve a site of predilection for such poisons as alcohol, lead, arsenic, etc. This produces the well-known drop foot.

I have had the unpleasant task of treating several cases of drop foot due to stretching for sciatic neuritis. This is an example of how paralysis really can result from over-stretching of a nerve.

Continuous stretching of the extensor muscles of the ankle and the toes in bedridden patients due to gravity and the weight of the bedclothes is an example of atrophy produced by stretching of the muscles.

In hemiplegia we have a different type of a drop

foot. Due to cerebral irritation we have a muscle tonus changed into a muscle spasticity; the flexors getting the better of the pull producing a drop foot. In this connection it is of interest to note how much sooner and how much oftener the low extremity returns to useful function in a hemiplegia patient compared to the upper extremity. If the demand for function which is forced on the lower extremity in walking is responsible for this recuperation, I do not know. I like to believe so, however, for the sake of those spastic children which we try so hard to save for a useless, joyless and burdensome, longer life.

This drop foot problem always includes a stretching of the extensors of the ankle and toes with accompanying contraction of the flexors of the ankle and toes. When treating these cases, the foot should always be held in 90 degrees to the leg by a brace that relaxes the extensors and stretches or, at least, prevents contraction of the opponents. The application of heat for the nutrition of such atrophying extensors or the contractions of such muscles by means of electrical currents or the muscle reeducation of these same muscles will give better results when the principle of the most favorite position is applied.

The same principle holds in the treatment of a ruptured plantaris muscle. This is not a rare occurrence and is seen in tennis and baseball players. The proper position here is with the foot in flexion—which is accomplished by raising the heel, thereby shortening the plantaris muscle.

WEAK FEET

In dealing with the weak abducted foot we have an example of concentric muscles, the tibialis posticus and the tibialis anticus being overstretched and probably undergoing the same changes of atrophy and deterioration. I am speaking of the abducted foot with lowered longitudinal arch. It is only rational to believe that such a change in foot structure as the abduction of the foot, must lengthen or stretch the tibialis posticus and the lowering of the longitudinal arch will do the same thing to the tibialis anticus. The Whitman plate recognizes and therefore corrects both these deformities. The lateral heel spur corrects the abduction and the raised medial part of the plate raises the arch. If we recognize the flat, abducted foot from this point of view and return the tibial muscles to their original normal length, we will be more successful in our physical therapy treatments when they are directed toward improving the circulation or relieving the pain or strengthening the deficient muscles or correcting the body-mechanics.

CONCLUSIONS

It is evident that it is easier to prevent deformities than to correct them. In order to prevent deformities, the various parts of the body have a definite, most favored position in which they must be placed. In a general way we must support or prevent overstretching of the muscles performing movements away from the body. We must place an extremity in such a position that the weaker extensors are favored over the stronger flexors, etc.

The effect of gravity on muscle weakness also determines to a certain extent the deformity and must be reckoned with. I believe that many of us have not got the maximum result in our physical therapy treatment because we have had our attention too much centered on the actual treatment and not enough attention has been paid to the physiological pathology underlying our problems.

A New Treatment for Acute Bursitis (Preliminary Report)

By T. K. Richards, M.D.

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Some months ago, while treating a patient for boils who, also, had symptoms consistent with a mildly inflamed subacromial bursa, intramuscular injections of iron-arsenic compounds were used along with other forms of therapy. This particular patient was a chemist by profession, familiar with drugs and unusually observant of his own reactions to drugs. After each injection of the iron-arsenic compound he volunteered the information that his bursa felt better. He was told that there was no rhyme or reason why it should feel better because of the injections, but he replied that it was his shoulder and he knew.

Shortly after this the bursa became more acute and it was decided to try the iron-arsenic preparations intravenously. Accordingly, iron cacodylate was chosen because of its apparently less severe reaction and 1 cc., or 1/5 of a grain, was given. The dose was repeated every third day, increasing the amount by 1 cc. until 5 cc., or 1 grain, were given. Following the first injection there was a distinct improvement; the shoulder was less painful and its motions were freer. At the end of five injections the acute symptoms had disappeared and there was no restriction of the shoulder motions.

The result was so startling that other patients suffering from acute bursitis were asked if they were willing to try these injections—all being told beforehand that there was no adequate explanation for the drug working. In all there have been approximately seventy cases of acute bursitis—the subacromial, subscapular, and infrapatella bursae being involved. In many cases of acute bursitis uncomplicated by a focus of infection elsewhere in the body, there has been an immediate lessening of the acute symptoms within three or four hours following the first injection. The vast majority of these patients have returned to their normal activities or play with complete absence of symptoms and no restrictions of motions, from ten to twenty-one days following the first intravenous injection.

In this series all other forms of treatment have been avoided so as not to complicate the picture of recovery. There has been no restriction of use beyond that of pain. In other words, patients have been told to use their arms as much as they pleased or could. Iron-arsenite and iron cacodylate have both been employed, but the iron-arsenite seems to be more frequently accompanied by immediate severe reactions, which are not present when the cacodylate is used. Accordingly, the use of the iron-arsenite has been abandoned and all injections have been made with the iron cacodylate.

The general procedure of treatment has been to give not more than 3 cc. or 3/5 of a grain of iron cacodylate intravenously on the first visit. On the 3rd or 4th day the injection is repeated, using 5 cc., or 1 grain. This has been repeated every 3rd or 4th day until symptoms have disappeared. The number of doses required to do this has varied somewhat, apparently depending on the duration of the disease and its severity before treatment was begun. In husky, robust athletes it has been found advantageous to give the injection every other day. This procedure has been carried out for a year now and in no case where a small dose has been given first has there been any unfavorable reaction. In one or two cases the full dose was given immediately. This was followed in five or six hours by a feeling of chills and fever resembling the onset of an acute grip, which has lasted for twenty-four hours and then disappeared. Needless to say, care must be taken in giving iron-arsenicals intravenously. It should be given slowly and great caution should be used not to inject any of the drug into the tissues about the vein as such injections are accompanied by acute local pain.

This report is not in any way an attempt to analyze various forms of bursitis or to discuss the pathology of this condition, but is merely to bring before the medical profession a simple and safe form of treatment that to date, apparently, is proving to be nearly one hundred per cent efficient in the treatment of a common and painful condition which ordinarily lasts for many weeks, if not months, and not infrequently results in serious mechanical disabilities.

To date there is no evidence which shows that there is any hastening of the absorption of the lime deposit in the bursae which could be demonstrated by x-ray, although the acute symptoms have subsided under treatment. Nor is it claimed that intravenous injections of iron-arsenic will do anything for the end result of an acute bursa—namely, periarticular adhesions or a frozen joint—but it will relieve the acute symptoms in a most surprising fashion and by making motions painless will prevent the formation of periarticular adhesions and thus avoid the distressing complications so often noticed.

The following three case histories illustrate the effectiveness of the treatment of acute bursitis by intravenous injections of iron cacodylate:

CASE No. 1.

A white woman of 47, seen on February 13, 1931, had noticed two days previously some pain and tenderness in the right shoulder. She thinks she first noticed it after playing golf. The

symptoms became more severe and the night before she had been unable to sleep.

Physical Examination showed the right arm held rigidly to her side, severe pain in the subacromial region on the slightest motion of the right shoulder, localized tenderness in the region of the subacromial bursa.

X-ray examination showed a shadow consistent with a calcified bursa over the head of the right humerus.

Treatment: 3 cc. (3/5 grain) of iron cacodylate were given intravenously. There was no immediate reaction.

On February 16, 1931, the patient reported that within three hours of the first injection she slept comfortably and the next morning all pain was gone.

Physical Examination showed no tenderness in the region of the bursa.

Abduction to sixty degrees was free and without pain.

Treatment: 5 cc. (1 grain) of iron cacodylate were given intravenously.

On February 20, 1931, the patient reported that she had no pain and was driving her own car.

Physical Examination showed complete range of motion of the right shoulder and no areas of tenderness.

Treatment: 5 cc. (1 grain) iron cacodylate were given intravenously.

On March 20, 1931, there had been no recurrence of symptoms.

X-ray examination showed no change in the calcified bursa, as seen in the film of February 13, 1931.

On May 1, 1931, there had been no recurrence of symptoms and x-ray failed to show any lessening of calcification of the bursa.

Duration of disease nine days.

Number of injections three.

CASE NO. 2.

A white male of 50, seen August 1, 1930, had been thrown from his horse thirteen months previously striking his left shoulder. He did not have much trouble at the time but about ten days later the shoulder began to be lame and motions, such as those used in putting on a coat, were very painful. In spite of the disability he tried to play court tennis and take part in other forms of sport. After each attempt the shoulder was acutely lame for several days. Baking gave temporary relief and massage did not materially improve the condition. He could not sleep on his left side.

Physical Examination showed a slight area of tenderness over the tip of the left shoulder just below the acromion process. There was present the normal range of motions of the left shoulder but abduction between 80°-110° was painful. Either internal or external rotation was painful and the pain was increased if these motions were attempted when the arm was abducted.

X-ray examination was negative for bone injury or calcification of the bursa.

Diagnosis: Subacute subacromial bursitis.

Treatment: Diathermy every other day.

On September 16, 1930, in spite of regular diathermy treatments and exercise, the shoulder had not improved. Motions remained as they were five weeks before. Teeth, tonsils, and sinuses examined for a possible focus of infection and all were reported negative.

Treatment: Diathermy omitted. 3 cc. iron cacodylate given intravenously.

By October 13, 1930, there had been little, if any, change. The patient stated he thought the shoulder might feel a little better at times.

Treatment: 5 cc. iron cacodylate given intravenously.

By October 16, 1930, there was a decided change for the better. The patient then only felt pain on certain motions, and had played tennis without recurrence of symptoms.

Treatment: 5 cc. iron cacodylate intravenously.

On October 23, 1930, he was having no pain and could sleep on the injured shoulder without discomfort. He had been riding horseback, jumping, playing tennis, etc., without any discomfort. The range of motions was normal.

Treatment: 5 cc. iron cacodylate intravenously.

On November 25, 1930, the patient reported that there had been no recurrence of symptoms and he was doing everything.

Duration of disease fourteen months.

Number of injections four.

CASE NO. 3.

A white male of 45, was seen March 22, 1931.

Three days previously he had consulted an osteopath for pain in the left shoulder. He was told that shoulder was partially out of joint. The shoulder was manipulated, followed by increased pain. The day before manipulation had again been attempted without relief. For the past three nights he had sat up in chair, the only relief from pain following injections of morphine.

Physical Examination showed a well-developed, very muscular man of athletic type, obviously suffering acute pain in the left shoulder. The outer end of the left clavicle was slightly more prominent than the right but there was no tenderness in this region. (This deformity was the result of an old football injury twenty-five years ago.) There was no obvious deformity characteristic of a shoulder dislocation. Any attempt to move the left shoulder was accompanied by extremely sharp pain. The pain was so severe that further attempts to determine the range of joint motion were abandoned. The area about the head of the humerus was extremely tender to touch.

X-ray examination was negative for bone injury or dislocation. There was a large shadow consistent with a calcified subacromial bursa.

Diagnosis: Acute subacromial bursitis.

Treatment: 3 cc. iron cacodylate intravenously.

On March 25, 1931, there had been no relief. He was still having acute pain and was unable to sleep except after morphine injections. Heat aggravated the condition.

Treatment: 5 cc. iron cacodylate intravenously.

On March 27, 1931, the pain was much less. He had taken no morphine. There had been no improvement in motion.

Treatment: 5 cc. iron cacodylate intravenously.

By March 30, 1931 he was much more comfortable and was using no sendatives of any kind. He could abduct the arm 20° without pain.

Treatment: 5 cc. iron cacodylate intravenously.

On April 2, 1931, there was abduction to 100°, free and without pain. Rotations were seventy-five per cent of normal. He played squash racquets the day before. (Patient is left handed and the left shoulder was the affected joint.)

Treatment: 5 cc. iron cacodylate intravenously.

On April 6, 1931, there were complete shoulder motions with almost no pain.

Treatment: 5 cc. iron cacodylate intravenously.

On April 9, 1931, there was no disability. He was doing everything. Motions were complete and there was no pain.

X-ray examination showed no change in calcification of the bursa.

Treatment: 5 cc. iron cacodylate intravenously.

On April 15, 1931, the patient said further injections were unnecessary.

(N. B. This patient had a calcified bursa in right shoulder five years ago which caused more or less disabling symptoms for eight months. An x-ray of this joint failed to reveal any calcification of the bursa.)

Duration of disease eighteen days.

Number of injections seven.

Therapeutics of Static Electricity

By William D. McFee, M.D., Boston, Mass.

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To successfully practice physical therapeutics and more particularly electrotherapeutics the physician should have a complete equipment. Limited results may be obtained in the treatment of certain conditions with one piece of apparatus, but each electrical agent used has its particular indications and limitations for such use.

Static electricity is the means *par excellence* for the treatment of conditions wherein we wish the combined gross effects of mechanical massage and exercise or the minute effect of cell gymnastics. While claims are made that all static action can be duplicated by the galvanic, faradic, or various sine wave outfits and even by high-frequency currents, it is the consensus of opinion among those who have made use of static electricity that this current occupies a place of primary importance in the field of electrotherapy and that the results from its use in the treatment of many conditions have made it an indispensable requirement in a completely equipped physical therapy department of a hospital or in a physical therapy clinic arrangement.

We shall not take the time required to present the history of the development of static apparatus, as this can be obtained readily from one of the many books written on this subject. It is sufficient for our present purpose to state that the use of static electricity in medicine dates back to some time in the sixteenth century, that it has well stood the test of time up to the present, and its great value in therapy is generally admitted by those who have thoroly tested its merits. Technical knowledge including the physics of electricity and a familiarity with the construction features of apparatus is most important to the student who wishes to have a thoro grounding in his subject, but this takes much thoro investigation and is time consuming. A knowledge of the principles of the action of the current and its control combined with the methods of its application and its indications in therapy is the principal requisite for the physician who would employ it intelligently. This applies, of course, to all electrical agents in which we as physicians are interested. We shall, therefore, limit our attention almost entirely to the discussion of the static application, indications for its use, some reference to the effect produced and the qualities of static electricity.

The best current output from the static machine will be obtained if the following is kept in mind. The apparatus should be located in a well-ventilated, sunny room. The cabinet should be opened to change its air at frequent intervals. The interior of the cabinet should be kept clean and dry. Unslacked lime serves its purpose well as a drying agent, being placed in containers in some manner which will prevent dust from being deposited on the plates and metal parts as the lime becomes slacked. Time and effort in this regard will be well repaid in the delivery of the necessary quality and volume of current. Many times if the volume of current in the static machine is insufficient or the machine is discharged it will pick up quickly if one end is opened and the air from a motor fan is directed into the case. Lye placed in dishes within the cabinet has also been found effective as a drying medium. Babbitt's lye has given the best results. Other ways and means of drying the static machine have been advocated from time to time, but as far as known nothing has been better than those mentioned.

The static applications which are in most common use today are those known as the static wave, sometimes referred to as the Morton wave, the static sparks, and the static brush discharge. Occasionally the crown breeze is utilized for its sedative effect, particularly in the relief of congestive headache.

Among the physiologic effects of this current may be mentioned its action on circulation in regulating arterial tension, heart rate and volume; the induction of various degrees of muscular contraction and relaxation, thus promoting drainage in areas of induration; the stimulation of local secretions, the antiseptic, sedative, and stimulating action on the skin; the lessening of nervous irritability, and its remarkable general tonic properties producing decided improvement thru increased metabolism.

The therapeutic indications for the various static machine currents are all conditions wherein the local or physical effects just mentioned are desired, and they present a very wide range of application. The static current removes local exudates, giving many times almost immediate relief of pain, overcomes muscular spasm, promotes functional activity, and acts as a stabilizer in conditions characterized by muscular, nervous and circulatory inactivity.

The more common conditions in the treatment of which these currents are of value are arthritis, acute and chronic; sprains, strains, and contusions; glandular congestions, particularly prostatic congestion; the many forms of skin diseases; and functional as well as organic nerve disturbances. The static current also has a big field of usefulness in abnormal digestive troubles and

may be employed for the relief of much of the suffering found in the functional derangements peculiar to gynecology.

Every case of arthritis, acute or chronic, can be most satisfactorily treated and symptomatic relief obtained by the static wave, sparks or brush discharge combined at times with surface or penetrating heat measures, massage and motion. The static alone is sufficient to relieve and permanently improve many cases of this common ailment.

So much has been accomplished by the static electrical treatment of prostate gland disease that no paper on this subject would be complete without calling this to particular attention. The congestive type of this common trouble can be completely restored to normal in practically every case. Symptomatic relief is obtained even in those cases which are characterized by extreme hypertrophy due to fibrous tissue formation. The only contraindication here would be the presence of malignancy. The technic employed is as follows using the wave current: Introduce into the rectum a mental electrode having a concavity near its end which will fit over the gland. With the negative grounded and the patient connected to the positive side, start the machine. The strength of the current is increased gradually from zero to a point of comfortable wave tolerance and continued for twenty minutes. Treatments should be given at intervals of once, twice, or three times each week, and depends upon the patient's condition. The acute condition should be treated less often. The alternate mechanical contraction and relaxation effect forcing out accumulated secretion and establishing drainage thru the vesicles removes passive congestion and produces muscular stimulation. Oftentimes marked relief is experienced from the first treatment. The large number of the male population of advanced years suffering from prostate gland disease which responds very little if at all to the use of drugs, and the fact that many of these sufferers at some time may be subjected to the dangers and many times unsatisfactory complications of deliberate surgical measures, identify the static machine as a means of relief, prevention, if used early, and a curative factor in many of the long-standing prostatic conditions which renders it worth while if this were its only field of usefulness.

At the time of the first treatment with static always tell the patient frankly what he may expect by way of sensation and effect. This will make him more comfortable and increase his confidence in your efforts in his behalf. Have the patient remove all metal articles from the clothing and person, as these will attract the current and cause irritation. When the machine is started always note the polarity, that is, determine which side is negative and which is positive. One accustomed to observing the effluve passing between the terminals will readily know the polarity by the difference in color and density of the discharge from each terminal, that from the positive being thinner and of a bluish tinge. The beginner will be more sure if he tests the polarity by bringing a pointed stick in contact with one of the terminals, when it will be noticed that the positive discharge will follow the stick with a fan-like appearance as it is moved to and fro.

STATIC WAVE CURRENT

The wave current, sometimes referred to as the Morton wave, is the one most generally used. In administering this, the patient is seated on an insulated platform at least three feet from the machine. The electrode of some material such as block tin or other flexible metal, selected with reference in size and shape according to its adaptability to the part treated, is applied, in contact with the skin (kept so by bandaging or counter pressure of sand bags or hot water bottles) and connected to the positive terminal by a fine copper wire, the negative terminal being grounded. The generally accepted rule in all static applications is to always ground the negative pole except when administering the static brush discharge, wherein we ground the positive. The circuit being closed, the current is turned on. As the terminals are gradually separated by the operator, who should work from the side grounded, a stream of sparks or effluve is produced. Slowly increase the length of the spark gap to the limit of the patient's comfortable tolerance. If at first, due to the skin being extra dry, the patient complains of a burning sensation, close the circuit and moisten either the skin or electrode, altho in a short time the skin will of itself produce sufficient moisture to overcome this discomfort. The rate of the current flow between the terminals should be varied according to what is desired, and experience in its use will determine what is needed in each particular case treated. It must neither be too fast nor too slow. Treatments should be given two or three times a week in chronic cases, and daily in acute cases, lasting about twenty minutes each. It is always well to make the first application a mild one, as a sort of initiation, particularly if the patient is of a nervous type. During the last two or three minutes a very agreeable and efficient surging effect may be produced by gradually and slowly moving the terminals back and forth thus causing alternate muscular contraction and relaxation, a very good form of passive exercise. Practically all diseases or diseased conditions acute and chronic in which inflammation is a factor are amenable to this application, such as neuritis, arthritis, bursitis, synovitis, myositis, sprains, strains, pelvic and glandular congestions, and various dysfunctions. The general as well as local vibratory static action is very helpful as a reconstructive and tonic. Hospital and private clinic records are replete with reports of countless numbers of patients with many of the varied diseases relieved and restored to normal by this measure. Special electrodes have been designed for use in canities as in the rectum and vagina.

It is well to remember that static as well as massage and other mechanical forms of treatment are to be preceded by the use of some form of heat to get the best results.

STATIC SPARKS

The indirect static spark is the one now generally employed. For this the patient sits on the insulated platform which is connected to the postive side of the machine by a rod known as the Shepherd's crook, the platform contact with the rod being a metal plate. The negative side of the static is grounded. A brass ball electrode held by the operator is also connected by a chain or wire to the ground. The operator should experience no discomfort in administering this treatment. Move the electrode with a wrist motion or sliding arm effect over the part to be treated. The length of the spark will be varied in accordance with the penetration desired. For deep-seated lesions use longer sparks. This can be regulated by changing the speed of the machine or partially closing the discharging rods or eliminating the metal contact from the platform. An electrode which is sometimes called a localizer may be used in directing the sparks into a cavity. This is accomplished by touching a metal contact on the directing electrode with the active ball electrode. Sparks are most useful and are indicated in the treatment of surface inflammations, small joints, areas of induration which do not contain pus such as acne papules, chronic skin affections for the tonic action, and in the treatment of muscles which are atrophied or reduced in energy, also very help-

ful in the treatment of pain in muscles and as a reconstructive aid in those recovering from certain forms of paralysis.

BRUSH DISCHARGE

The static brush discharge is an expression which is applied to the spray coming from an electrode toward the skin. The most satisfactory electrode for this purpose is one made from a green or unseasoned wooden stick and many times a portion of an ordinary broom handle serves the purpose very well; this should be thoroly soaked in water. The patient as in the other treatments is placed on the insulated platform. The discharging terminals of the machine are widely separated and the positive side is grounded. This is about the only exception to the rule for grounding in static treatment. The Shepherd's crook is connected from the positive side to the platform or it may be held in the hands of the patient, which will give an increased effect. The electrode should emit a discharge of at least two or three inches in length and the spray applied directly to the affected skin. A movable metal collar is applied to the stick electrode and the operator will hold this, which is also connected with the ground chain. Use may be made also of electrodes which have been specially designed for this purpose, one of these being known as the deKraft blue pencil brush discharge electrode. This concentrates the discharge at a given point. The electrode should be kept constantly moving over the surface, as in this way we shall avoid the development of any unpleasant reaction such as possible blistering. The application should be continued for from twenty minutes to a half hour. The static brush discharge is a very effective treatment in all cases of surface inflammation and in practically all skin affections. It has antiseptic, stimulating, and rubefacient properties. Acute swelling such as accompanies sprain, or strain of muscles and ligaments is markedly reduced with this method. Pain is quickly relieved by its use.

The treatment of surface ulcers is very satisfactory when the static brush discharge is employed. The time of treatment will vary according to the condition, but usually it is continued for from twenty to forty minutes. Daily applications are the most effective. Many other methods of usig static electricity as a means of treatment have been employed by various operators, but as far as known no different result has been obtained than that which has been accomplished from the measures mentioned, and none are more convenient to use or more comfortable to the patient.

So that summing up the value of this current as a means of treatment we might well state that its best qualities are delivered when use is made of the wave current, sparks, and brush discharge, and that the use of the properly selected static technic as a reconstructive agent thru its wellknown stimulating and tonic properties is indicated and may be employed to great advantage for the improvement of all diseased conditions wherein it is desired to stabilize circulation, to restore imbalance of function, to increase metabolism, and to modify or remove the local manifestations of injury or disease.

520 Commonwealth Avenue.

The Post-Paralytic Treatment of Poliomyelitis from the Orthopedic Standpoint

By Walter I. Galland, M.D., New York City

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It is a difficult task to attempt to elucidate before a body of physicians any hopefully useful outline for their guidance in treating the patient crippled by the scourge of poliomyelitis. After listening to a symposium upon this subject we are all apt to echo the thought of the poet-philosopher Omar Khayyam who said:

"Myself when young did eagerly frequent
Doctor and Saint, and heard great argument
About it and about; but evermore
Came out by the same door wherein I went."

Perhaps tonight you too will feel that you are departing by the "same door wherein you entered," for the final page in the treatment of this disease has yet to be written. The best that can be offered, in the present stage of our knowledge are some thoughts which may be of help in eliminating those factors which may lead to avoidable and severe crippledom.

We cannot entirely dissociate the convalescent care of the paralytic patient from that of the patient in the acute stage of the disease, for the dividing line between these phases is not well defined, and certain of the symptoms of the acute stage are apt to extend rather indefinitely into the convalescent period and complicate the handling of the case from a purely orthopedic standpoint. It is a common experience in the handling of this disease to meet with a type of case which may well be termed "hyperaesthetic poliomyelitis." This symptom complex varies in the different epidemics and at times dominates the picture. The patient exhibits sensitiveness to even the gentlest manipulation of the involved parts and frequently even the most guarded movements elicit excruciating pain. Not rarely there is associated spasm of the uninvolved muscles which is apt to cause the early development of marked deformity. I have seen cases with hyperaesthesia referred to a hip joint with associated spasm of the flexors and adductors so intense that intra-articular pathology was suspected. Hyperaesthesia of the leg and ankle will frequently produce in these subjects a rapidly developing and rigidly resistant equinus which cannot be controlled in plaster or in splints without tremendously increasing the pain. Massage and any form of artificial muscle stimulation serve only to prolong the period of hyperaesthesia.

SUPPORTS FOR PREVENTION OF DEFORMITIES

It is important then to consider the means by which this troublesome syndrome can be most readily ameliorated so that deformities can be painlessly prevented or overcome and rational therapy instituted. In a large proportion of these cases absolute rest and freedom from irritation, which means of course total abstinence from any attempts at manipulative procedures, will effect a satisfactory subsidence of these troublesome sensory symptoms. For the patient who exhibits a prolonged persistence of hyperaesthesia, the skillful use of x-ray therapy applied to the involved spinal segments will frequently cause a rapid disappearance of pain. Such treatments are given at weekly intervals, employing a 20 per cent skin erythema dose. Exposures should be made alternately on the anterior and posterior surfaces of the body at the level of the involved spinal segments. Reasonably consistent results from this treatment can be expected.

The disposition towards the rapid development of deformity in poliomyelitis and the necessity of preventing the development of deformity is too well recognized by the physician to require elaboration on my part.

The factors which are responsible for the deformities characteristic of this disease are disturbance of normal muscle balance, gravitational influences, posture, static strains, and trophic tissue changes. These are the factors which must be considered in our campaign against deformation.

In the early days of the illness, even during the active stage, the affected parts must be supported. At this period sand-bags and properly placed pillows are usually adequate to maintain the desired position of the paralyzed members. Foot drop, flexion contractures of the knees and hips and even lateral deviations of the spine have their beginnings early in the disease. Apart from the crude method of sand-bag support, which latter must be used only as a temporary expedient, we have at our command two methods of effectively controlling deformity. We can resort to the use of plaster of Paris or to the use of braces and other mechanical devices. Which of these methods we use will depend upon the exigencies of the situation and on the availability of a good brace maker who is susceptible to medical guidance.

Plaster of Paris as a means of preventing deformity is peculiarly suited to the early stages of convalescence. It must be applied in such a manner as to support the paralyzed parts insofar as possible in a position favor-

ing the return of muscle tonus and proper articular function. The total inclusion of any considerable portion of the body in irremovable plaster casts over a long period of time, as is frequently done, is to my mind illogical and unphysiological. The plaster should be bivalved after it has set so that the parts can be removed for inspection, treatment or exercise of the included members and subsequently replaced. The use of the plaster of Paris shell is to be heartily recommended, particularly when the back is involved. This shell is moulded directly upon the patient in the following manner. The patient is placed in the ventral decubitus upon a firm table. The spine is slightly hyperextended and the spinous process brought into alignment. A layer of light felt is placed over the back, and over such other parts as may be included in the shell, and over this felt, held smoothly and firmly to the parts by assistants, plaster of Paris bandages are placed, layer by layer, until sufficient thickness of plaster has been secured. The finished shell fits the body accurately and in this shell the patient lies held securely but comfortably in the corrected position, while at the same time there is no confinement of the costal cage or abdomen, and respiratory and abdominal movements are free from interfering confinement. In this device, too, the patient is always easily available for the purposes of any treatment whatsoever.

In applying plaster of Paris dressings to the paralyzed parts, we must always consider the nature of the muscle involvement. In cases in which one group of muscles is involved without any weakening of the antagonist group, we must make an effort to somewhat overcorrect the impending deformity, so that the origins and insertions of the affected muscles are brought together as close as is reasonably possible. A weakened muscle over-stretched by the constant tonic pull of an active antagonist will never regain power; a fatigued muscle too, will never regain power if it is always under constant stress. A weakened muscle must be relieved from all gravitational and postural stresses which produce fatigue, and must be placed at rest in that position which permits the involved muscle to retract to its normal tonic length.

POSITION OF EXTREMITIES

There are so many varied types of involvement in infantile paralysis that no arbitrary rule can be established to guide us in determining the position in which a part should be held during the convalescent stage. In general we may say, that the feet should be kept at right angles to the leg, in moderate inversion, or if the tibial muscles are involved, in marked inversion. On the other hand, if the tibial muscles are active and the personal muscles are paralyzed, the foot must be placed in marked eversion in order to relieve the paralyzed muscles from strain. In the presence of a paralysis of the gastrocnemius group, the foot must be placed in a position of extreme equinus unless the dorsiflexor group is also involved, in which case a neutral position at right angles is essential. The knees must always be kept in complete extension except perhaps in that unusual case in which the quadriceps extensor muscle is uninvolved, and the hamstring muscles are paralyzed, in which situation a semi-flexed position of the knee, carefully supervised to avoid any possible supervening capsular contracture, may be permissible. It is essential for all of us to realize the importance of the knee joint in cases of infantile paralysis. The existence of even a mild flexion contracture of this joint in the presence of the slightest weakness of the quadriceps muscles will lead to a very grave and avoidable disability. The slightly flexed joint is prone to collapse very much as would a partly closed blade of a pen-knife, if longitudinal pressure were exerted upon the handle of the knife with the point resting upon a firm surface. When the blade of this knife is fully open and in alignment with the handle, full pressure can be made upon the handle in the same situation without causing the blade to close. The knee joint behaves in exactly this manner, and for this reason, we must see that we always have a completely extendable knee, for with such an extendable joint even in the presence of complete paralysis of the quadriceps a patient may be able to walk without the use of any apparatus whatsoever.

In a similar manner flexion deformity of the hips is to be guarded against, as this deformity is well-nigh as incapacitating as the flexion deformity of the knee. The hips should always be fully extended and should be kept in neutral rotation so that the patella faces forward.

In the upper extremities the most usual incapacitating involvement is that of the abductors of the shoulder. By virtue of this paralysis the arms hang closely adducted to the body, and there is very early development of subluxation and diastasis of the shoulder joint. It is important to establish an abducted position of the shoulder in the presence of this paralysis either by means of plaster or by means of an abduction brace. The arm should be held in the majority of cases at right angles to the body in ten to fifteen degrees of forward flexion with the elbow at right angles and the wrist in dorsiflexion.

In paralysis of muscles of the back, the spine must be held in absolute alignment and in a slightly hyperextended position. The convex gas-pipe-frame is most useful in providing protection for the paralyzed back.

REHABILITATION OF MUSCLE FUNCTION THROUGH PHYSICAL THERAPY

The period of immobilization cannot be arbitrarily fixed. With the complete disappearance of hyperaesthesia and muscle tenderness, and after it is evident that all acute manifestations have totally subsided, we must begin to attempt to rehabilitate muscle function. Our object will, of course, be to gradually encourage the use of the involved parts by means of carefully graduated exercises. It will always be necessary to avoid overtaxing the involved muscles, and for this reason we must at all times, particularly in the early phase of returning muscle power, attempt to reduce resistance to an absolute minimum in regard to any given motion. For this reason exercises given with the body immersed in warm water have come into widespread use. Inasmuch as the body is of approximately the same specific gravity as water the extremities are virtually floating, and are therefore unweighted, and motions can be consummated against a minimum of resistance. The water bath, however, is not essential, as it is usually possible to place the extremities in positions which remove the resistance offered by gravity, and thus we can secure minimal resistance to motion.

Exercise periods must not be unduly prolonged and fatigue must be assiduously avoided. Physical therapy is of value in supplementing voluntary exercise, but the undesirability of overtreatment must be kept in mind. A few contractions of a muscle by means of electric stimulation may be useful in maintaining muscle tone providing such contractions are consummated without pain and are not persisted in to the point of fatigue. It is obvious, too, that a muscle belly thoroughly warmed to a point slightly above body temperature will be more responsive to voluntary and artificial stimulus than the same muscle would be in an extremity rendered cold by the trophic vascular changes so commonly seen in this affection. Massage relegated to over-enthusiastic pro-

ponents of that art is apt to be injurious. Purposeful and gentle massage designed to combat tendencies towards contractures is of considerable value.

ARTIFICIAL SUPPORTS

There can be no doubt that great injury is commonly inflicted upon the convalescent paralytic case by re-establishing weight-bearing function too early. The period of recumbency is usually not sufficiently prolonged. When it is determined that weight-bearing function can be re-established, it is essential to consider the desirability of supporting and protecting the weakened parts by means of adequate braces. A brace must be an efficiently designed mechanical device constructed in such a manner as to relieve the affected parts from certain undesirable stresses and deforming influences. The brace maker must not be the designer of the brace, but only the constructing mechanic. The physician must be the architect, and each brace must be an individual piece of machine design. Braces cannot be constructed on the basis of quantity output. There are several common defects in brace work, which should be avoided. If the apparatus or any part thereof causes undue pressure upon the body of a muscle, there will eventually ensue lasting damage to that muscle. It is a frequent experience to see braces with narrow metal calf bands which have by prolonged pressure caused deep grooves to be inflicted upon the calf muscles. These grooves mean that scar tissue replacement has occurred in the body of the muscles due to the persisting long standing trauma of the calf band. Likewise the pressure of metallic bands against bony prominences causes the development of painful inflamed bursae which add to the disability of the patient. The brace must always be constructed with a view to avoiding such difficulties. Encircling bands must be broad, and pressure must be evenly distributed. Padding must be adequate, and above all the brace must be purposeful.

A brace cannot be expected to correct deformities, unless they are of a very mild type, and therefore in so far as possible, we must attempt to overcome deformity before the application of a brace. A brace thus applied is able to preserve the normal contour of the extremity. For example, we do not attempt to prevent a flexed knee from collapsing under weight-bearing by means of a brace, for the necessary pressure exerted by the brace on every step will injure the extremity. We first correct the underlying flexion contracture of the knee, and then apply a brace merely for its stabilizing influence.

The use of the Thomas ring principle is most valuable in providing ambulatory support for a grossly weakened lower extremity. The patient thus provided bears the body weight upon the ischium and virtually sits upon his brace and the extremity functions in a practically unweighted state.

The support of a severely paralyzed back by means of a brace is a difficult, and perhaps an impossible problem in brace construction, and extreme caution is to be urged in re-establishing the erect posture in these cases, or else the most intractable deformities of poliomyelitis may ensue. When it is considered desirable to attempt to re-establish the erect posture in a case of a patient who has exhibited paralysis of the back muscles, great care is necessary in supervising the design of the spinal brace. Owing to the anatomical configuration and situation of the spine, we can approach the problem of supporting this flexible column only in a very indirect manner. It is obvious that the spinal column cannot be enclosed in a supporting mechanism as can an extremity which is immediately accessible. We can attempt in so far as possible to unweight the spine by throwing some of the carrying burden at least, upon the mechanical members of the brace. We can also attempt to indirectly exert forces resisting lateral deformations by counter-forces transmitted through the medium of the costal cage, and we can increase to some extent the rigidity of the spinal column by enforcing a hyperextended position thereupon, which, by causing firm interlocking of the intra-articular facets, establishes a certain degree of rigidity upon the spinal axis. The well-designed spinal brace for these purposes must have firm bearing upon the pelvis, and must by means of generously padded axillary crutches receive some of the weight of the shoulder girdle and maintain a symmetrical position thereof. At the best, the most carefully designed spinal brace is inefficient, and the back thus supported must be under constant supervision.

WEIGHT BEARING INDEX OF VERTEBRAL COLUMN

Attention must be paid to an early and extremely sensitive index of the behavior of the vertebral column under weight bearing. Particularly in somewhat stout individuals it is difficult from superficial inspection to determine the intimate alignment of the spinous processes, and before the deviation becomes grossly manifest from casual inspection, lateral curvature and rotary deformation have already begun. If, however, attention is paid not only to the position of the spinous processes, but also to the triangular spaces enclosed by the ilio-lumbar folds and the arms hanging in complete relaxation—the patient standing in erect posture—it will be noted very early, that the slightest deviation of the spine will cause an asymmetry of the triangular space on the one as compared to that on the other side of the body.

A second sensitive index, and one which is most important, is that of the so-called decompensation of the shoulders. By this we mean that the shoulders are not carried in vertical alignment with the pelvis. Plumb lines dropped from the acromio-clavicular articulations in such a decompensated spine will not traverse symmetrical points on the pelvis. Any increasing tendency towards decompensation must be regarded as a danger sign, and recumbency must be re-established. Persistently increasing decompensation calls for radical measures. The value of a plaster shell moulded with the shoulders decompensated towards the opposite side is great in the early stages of the development of such deformity. Intracable cases will, of course, eventually require stabilizing operations.

The advantages of the airplane type of brace in paralyses of the abductors of the shoulders should always be kept in mind. This brace should be so designed as to avoid undue pressure upon the ribs of the paralyzed side, as the constant pressure of the supported arm thus transmitted to the spine can predispose towards spinal deviations. On the paralyzed side the frame of such a brace should be carried down sufficiently to find a seating upon the pelvic crest. The elbow should usually be held at right angles, and the forearm should be in supination, inasmuch as this is the most useful position for the hand.

During the continuance of brace support, we must, of course, persist in all other measures which will encourage the return of muscle power through maintaining the tone and nutrition of the involved muscles. Physical therapeutic measures and supervised exercise periods must be persisted in. At all times the development of deformity must be watched for, and corrected in the earliest recognizable stage. The degree to which we can maintain normal relationship of parts will determine to a large extent the severity of the necessary operative procedures which may eventually be required.

SURGICAL INTERVENTION

It is generally conceded by those cognizant of the natural history of poliomyelitis, that the maximum period during which improvement of muscle power can be expected is from eighteen months to two years after the onset of the paralysis. Further improvement then can be expected largely from recourse to operative procedures. During this interval of expected progress the patient, usually a child, is of necessity subject to a régime naturally arduous and distasteful to the instincts of childhood. Medicine must be practiced as an art as well as a profession, and the art in this after-care is manifest by the physician who can succeed in securing the co-operation of his patient, by making the necessary régime assume at least some of the characteristics of play. The apparatus which is so uncomfortable that it becomes burdensome, and the exercise periods which engender resentment in the childish mind are ill-spent efforts. For this reason those institutions which have established the pool as a medium of re-educational exercise have had notable success. Swimming is an accomplishment which can be attained by even severely paralyzed subjects, and properly guided immersion exercises can be transformed into enjoyable play periods. Even without the convenience of a pool, it is possible to devise play exercises in the form of games and occupational therapy which can interest the mind and appeal to the play instincts without sacrificing the utility from the physiological point of view. This is a task which may tax our ingenuity and test our ability to practice the art of medicine.

After we have carried the patient through the period above mentioned, and it is evident that further natural improvement can no longer be expected, we must consider the advisability of operative intervention to secure further results. This does not mean that minor manipulative measures must not be resorted to before the termination of two years, for as has already been pointed out, contractures and developing deformity must be redressed as soon as they become evident. To even attempt to outline the multitude of operations which are at times indicated for the relief of the terminal disability of poliomyelitis would be a colossal task. In general we avail ourselves of three major types of procedures: first: the purely manipulative operation in which by carefully gauged but somewhat forcible manœuvres, contractures are corrected usually in the line of an articulation; secondly, operations which attack the soft tissues by open methods. Tenotomies, tendon lengthings, fasciotomies, capsulotomies and tendon transplantations are among the most important under this heading. And lastly, operations designed to secure stability of parts rendered more or less flail, by means of securing bony fusion between the articulations of the involved parts, and thus substituting firm bony ankylosis in the place of unstabile excessively mobile parts. This latter method has gained great favor in recent years.

The surgery of infantile paralysis has been a record of repeated trial and error. For a time great possibilities were looked for in the field of muscle transplantation, but unfortunately the results over a period of years have been disappointing. Combined, however, with the method of bone stabilization, transplantation is again coming into considerable favor in certain selected cases. Bone stabilizations on the other hand, while yielding excellent stability, frequently result in disappointing functional results by virtue of the inflexibility of the resultant elimination of normal articular motion. The question of operation must be approached with considerable circumspection. For the most part, we can aim only at a certain degree of improvement, and the physician and patient must appreciate, that there comes a time in every case when we must admit that the percentage gain in function from a possible operation does not compensate for the anaesthetic risk and for the operative morbidity, mortality and psychic injury. In our clinics are patients who drift from hospital to hospital chasing the phantom of hope for cure, and who submit to repeated operations; in fact, insist upon these operations in which the maximum functional gain expressed in terms of percentage of normal is pitifully small. We can by operation place many patients upon their feet, who otherwise would have spent their lives in wheel-chair invalidism. We can relieve others of the necessity of wearing braces, but in the vast majority of cases, we cannot produce conditions approximating cure, and therefore this word should be deleted from our vocabulary in regard to these cases. We should impress the patient with the distinction between improvement and cure, and we should ourselves have some conception for the benefit of the patient, when the limit of improvement has been attained.

CONCLUSION

The whole picture is unsatisfactory, but not discouraging. We cannot even in this age of science rebuild a dead anterior horn cell. We can, however, ameliorate the conditions which the death of that cell has imposed upon the animal economy. We can minimize the effects of the death of that cell to such an extent, that otherwise hopelessly impaired individuals can be returned by us to society as productive units in human affairs. This, however, can only be accomplished by the intelligent co-operation of the various methods outlined above. The management of poliomyelitis today involves no single method that is altogether inclusive. It requires the best co-ordination of the experienced internist, the surgeon and the Physical Therapist.

Occupational Therapy in Its Relationship to Physiotherapy

By Caroline N. Shaw, Robert Brigham Hospital, Boston, Mass.

Complete rest used to be considered one of the first necessities for recovery from illness. The medical profession as well as the laity are now realizing the phrase should be changed to constructive rest, which means guided activity interspersed with rest. One of these guided activities is occupational therapy—closely related to physiotherapy, using the same fundamental principles, but different means of execution. The occupational therapy medium is primarily the use of crafts, but the occupational therapist is given a wide range of activity as you will see when I quote the familiar definition given us by Dr. Pattison, "Occupational therapy may be defined as any activity, mental or physical, definitely prescribed and guided for the distinct purpose of contributing to and hastening recovery from disease or injury." The mental field is still the largest, but we are no longer limited to it. We now have occupational therapy in orthopedic and general hospitals and for the tuberculous. This re-birth or emphasis of occupational therapy is perhaps due to the War. The doctors wanted aides to go over seas to help amuse the boys who were convalescing. They discovered that the work was of value not only in cases of shell shock but that injured joints limbered up more quickly if they were being used in some craft work—really a normal activity. The psychological appeal of creating something is of tremendous importance. The physiotherapist gives an injured part active and passive treatment, then the patient may rest that part the other hours of the day in the most comfortable position. The probability is that the most comfortable position is not the one best for the joint. The occupational therapist comes along with a craft adapted to the patient's medical need to give that patient an active continuation or re-emphasis of the physiotherapist's treatment. For example, the physiotherapist has been working on abdominal retraction, shoulder flexion and abduction, chest expansion. The occupational therapist gives the same patient a treatment, weaving on a floor loom. The beater on the loom is built up and out so that as the patient reaches for it he gets increased shoulder motion. As he pulls it back to beat the woven material he gets abdominal retraction and chest expansion, emphasizing what the physiotherapist is emphasizing, getting even more of the same type of exercise through the normal activity of weaving a rug. Before he knows it the patient is interested in the work and gets the nearest possible approach to normal motion. The stimulation of creative achievement after enforced inactivity is of great value.

The occupational therapy training schools are training aides to go out and give occupational therapy in hospitals as real therapy and not merely as diversional craft work. This means the training includes medical as well as craft training with constant emphasis on the medical purpose and benefit to be derived from the treatment. The occupational therapy aide must unite the proper medical adaptation of the craft and the patient's interest in the finished product. The physiotherapist and occupational therapist should work in close cooperation. Each has a specialized field, but with the same goal. The work dove-tails closely. For example, a patient needs exercise such as work on a bicycle, jig saw. At first his muscles may be too weak to cut wood with the saw. Shall the treatment be under the physiotherapist at first and under the occupational therapist when wood can be sawed and a puzzle cut?

We are not trying to trespass on the physiotherapy field, we are simply dove-tailing and supplementing and extending treatments by means of crafts. In arranging the craft work the occupational therapist emphasizes posture and good body mechanics as carefully as does the physiotherapist in her work with the patient. The doctors must stand behind us for the best work of any occupational therapy department. Each patient must be accepted for treatment only on the doctor's order and prescription just as with the physiotherapy treatment. The doctor tells us what he wants to accomplish with each patient, what the dangers are, what the time limits are and we find a craft to fit that need. We are able to help post-operative joint cases. An elbow perhaps has been ankylosed for eight years, the surgeon decides to operate and make a new elbow joint. The muscles to use this new joint have atrophied from idleness. We give that arm work to do—very easy, very light work, increasing it gradually. It may be a string bag with simple over and under weaving or some coarse macramé knotting. We might put elastics on the bed for the patient to pull to help strengthen both triceps and biceps. At first the thinnest elastic offers all the resistance either muscle can stand. We gradually grade up to the heaviest weight elastic. This might be the job of the physiotherapist or as an active exercise (involving making or adjusting an exercise machine) it might be given to the occupational therapist.

The occupational therapist gives no passive treatment. All she gives to the patient must be done by the patient himself. Thus in infantile cases the patient needs the physiotherapist before the occupational therapist to build up sufficient muscle strength to allow the patient safely to use the muscle actively. The occupational therapist gives a craft where the resistance required helps strengthen the weak muscles. The occupational therapist simply provides the means for the patient to exercise and the supervision in the use of the means provided. In some hospitals it involves an addition to mere craft work, not only simple exercise machines, but games, riding kiddie

cars or tricycles. Shall it be called recreational therapy, occupational therapy or physiotherapy or shall we each dovetail and cooperate as need arises in our respective hospitals?

With fracture cases, there is a great field. Before a patient is discharged from the ward the occupational therapist may begin to limber up fingers, improve circulation, and to stimulate healing of an injured joint. After discharge from the ward the patient reports back to the occupational therapy shop at the hospital to continue treatments until full function is restored. And the doctors, skeptical at first, are now absolutely convinced of the virtue of this active work with the patients. A woman with a Pott's fracture is placed at a treadle jig saw. At first the injured foot merely rides on the treadle with the other foot doing all the work. Gradually she is able to exert pressure with the injured leg. Later she not only pushes the treadle, but is given wood to saw, thereby increasing the resistance and strengthening the muscles. Instead of having a stiff ankle and a dropped toe, she is able to use it normally much sooner than she otherwise could. Or if she has a broken wrist she may be started holding and winding a ball of wool to increase the grasp of those fingers that won't bend and to get the wrist moving a little. The occupational therapist will add a few simple exercises for her to do at home, and when the patient next comes to the shop she may be able to start on block printing. Grasping the roller which she must use to ink the block, placing the block and especially hammering it, give excellent wrist motion—and as the days go by a heavier and heavier hammer is used. No drug helps circulation to the joints, but the activity of the patient himself, guided by a trained worker, may do it and stimulate the healing process and thereby shorten the period of disability and in the end give more perfect function.

When you come to arthritis our field is large; for, as one of our Boston* doctors says, "Probably the greatest use for occupational therapy is to secure normal movement in joints when they are limited through disease; after fractures, splints, casts, operations and arthritis." And, in "arthritis for three seasons: first, the work can be made to produce every known movement of any joint in the body; second, it can be graded to any desired effort; third, it can be controlled." A private patient with arthritis who had a stiff elbow, quite limited in power of extension, said to me one day, "You know I do stretch that elbow more when I pull the knots in making my belt." And why not! All day she sits with her arm in the most comfortable position, which is a position of flexion. The physiotherapist comes in and exercises it for her, bakes it and massages it, and then back it goes to its position of easy rest. The occupational therapist comes along with another interesting problem—colored cord and a belt to be knotted. The patient wants to try to make the belt, and without realizing fully how much she is exercising that arm, on she goes using it, stretching it each time she ties the knot and limbering it up—until the occupational therapist says, "You must stop for fear of overdoing."

In starting a department it is important to have a trained worker. People who understand crafts may be able to help her, especially in a general hospital, but the trained person with a knowledge of kinesiology and psychology and with the background of training such as our occupational therapy schools give, should be the responsible head. It is she who should make contacts with the doctors for she is able to act on the diagnoses they give her and plan for the professional medical treatment which her crafts can give if properly administered. Such a trained person can measure joint motion and record on a graph the gains or losses so that the progress and results of the treatments may always be kept in mind.

*Dr. Loring T. Swain

The Health of Essential Nutrition

By Francis Lowell Burnett, M.D., Boston, Mass.

From the Massachusetts General and Peter Bent Brigham Hospitals. Read before the New England Section of the American Physiotherapy Association, Boston, Jan. 12, 1932.

I. Nutrition and Health

Sometime ago a philosophic physician remarked, "Food (is) the medicine of health, and medicine the food of sickness." (1) The purpose of eating is to nourish the body; but on account of the delicate, intricate, and correlated processes of tissue construction and repair, essential or anabolic nutrition is only little by little becoming understood. The action of the vitamins in curing deficiency diseases, the effects of liver or protein food and gastric enzymes in the regeneration of blood, and the reduction of carbohydrate food to restore the functions of the islands of Langerhans, are perhaps phases of essential nutrition. On the other hand, when the digestive system of the most highly organized being is regarded as a perfect nutritive apparatus, and food is ingested to bring into action a complex and delicately adjusted function of the colon, another phase of essential nutrition seems to be taken into account. As this function moulds the intestinal contents entirely into segments, to produce the presumably normal feces and intestinal rate,* it also serves as an exact, automatic, and delicately adjusted control of essential nutrition. For unless food is consumed sparingly in the fore part of the day, if it is not comminuted, complete, properly proportioned, and free of drastic drugs and oils, the mixture is passed along rapidly by the colon and the feces are not normally segmented. (2)

Health has been a vague and variable condition of the human body; but when erroneous ways of eating are corrected according to the control exercised by the proximal colon, the nutrient substances entering the body from this kind of digestion and absorption evidently create an exact and improved state of well being. And as this condition seems to be the result of better or more normal assimilation by cells, it has been called the health of essential or anabolic nutrition. (3) Furthermore, the restoration of health appears to be a matter of knowing more about health than disease, as a subtle etiological agent seems to be revealed through the means to detect and bring about this exact state of health. From this point of view, the relief and cure of some of the metabolic or deficiency diseases may be accomplished by educating patients to eat and live according to the action of their own nutritive apparatus. In this way, they must learn to consume food to have one and sometimes two normal dejections daily, yet the marked evening meal of the intestinal rate does not often appear before sixty-three hours and is frequently seen in the dejections until one hundred and thirty-four hours after ingestion. For if the intestinal rate is too rapid, nutritive material evidently goes through instead of into the body; and when it is too slow, insufficient or disproportioned food is generally consumed.

*The intestinal rate is the index of absorption from one meal in passing through the digestive system. To determine it, twenty-five cc of French millet seed or one hundred grains of charcoal are swallowed immediately after an evening meal, and then the number of hours that elapse from the time the marker was ingested to the time when the seeds or charcoal are first and last seen in the dejections is observed.

II. The Relief of Psoriasis and Arthritis

The acquisition and control of the health of essential nutrition have been applied especially in the treatment of psoriasis and arthirtis. From histories of patients with these diseases, "indigestion" from erroneous ways of eating is almost invariably revealed, and changes are advised. To find out the habits of eating more exactly, as well as to know the kind of absorption, each patient is required to write out the food consumed, the time spent at meals, the time and kind of dejection, and a determination of the intestinal rate, in a week's record of nutrition. These records are examined at intervals of a few weeks, the absorption of nutrient substances especially noted, and still more health measures, such as, "eat a light breakfast and lunch, or less cereal food and meat, etc.," are advised and written out at the top of the sheet for the next record of nutrition. A chemical and microscopic examination of the feces at the first visit, and some subsequent visits is useful to make proper dietary adjustments. At each visit the patient's weight is also determined, because through essential nutrition obese patients often become thinner and abnormally lean patients heavier.

Changes in the tissues from essential nutrition occur in months and years rather than days and weeks. Such a change may be seen in the patient's skin, shown in figures 1 and 2. In figure 1, the lesions of severe psoriasis are illustrated. In this condition the patient ate too much food and especially cereals, breads, cakes, macaroni, etc. In figure 2, is shown the normal skin of the same patient after fifteen months of improved nutrition. Alterations in the action of the nutritive apparatus and changes in the tissues, etc., of some more patients relieved of metabolic diseases, are described in the table. A comprehensive study of psoriasis is already in print. (4) Salves, washes, or the quartz lamp may also be used in the treatment of this

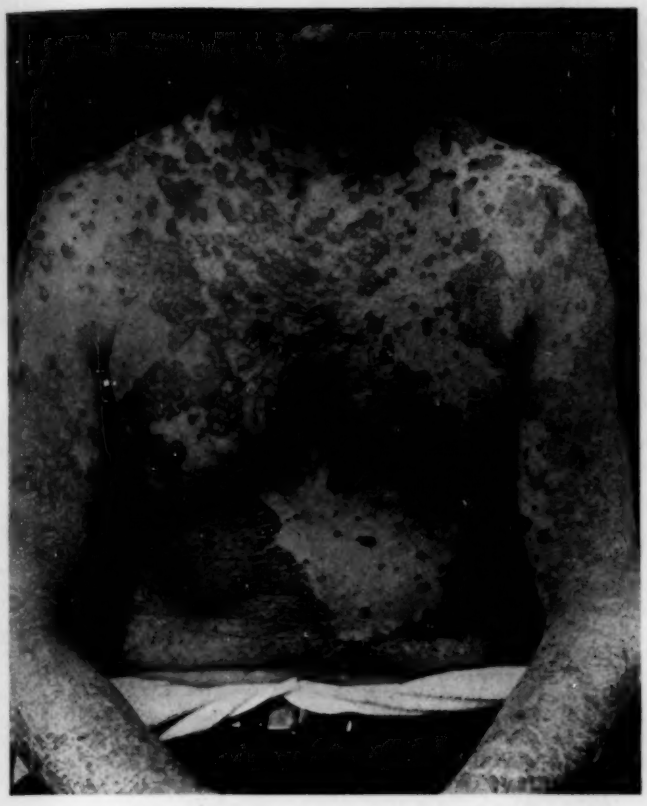

FIG. 1. THE SKIN OF A PATIENT WITH SEVERE PSORIASIS.

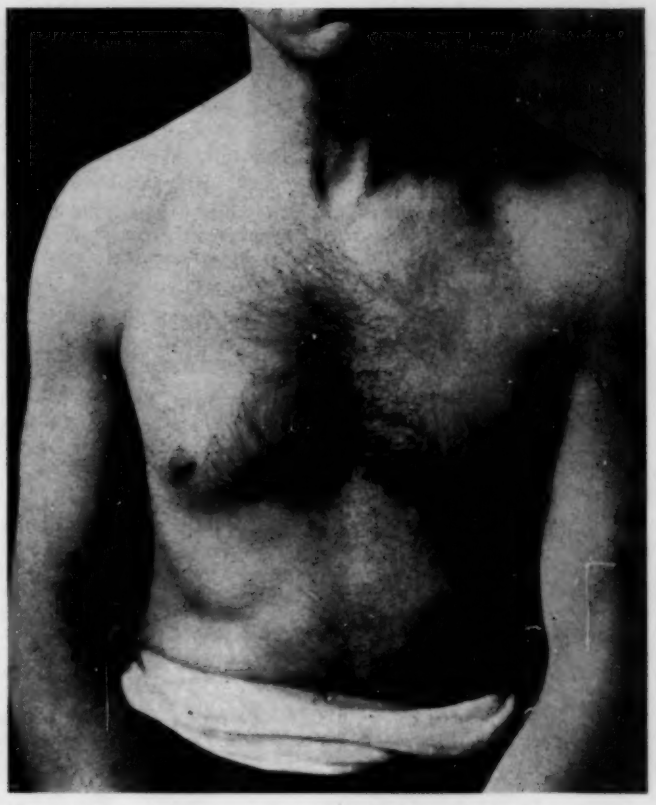

FIG. 2. THE NORMAL SKIN OF THE SAME PERSON AFTER ACQUIRING THE HEALTH OF ESSENTIAL NUTRITION.

disease to relieve symptoms. In applying the principles of essential nutrition to the treatment of arthritis, good results have also been obtained, as may be seen from the data of a few patients recorded in the table. A comprehensive study of arthritis, anabolic nutrition, and health in two hundred patients is soon to be published. While the requirements of essential nutrition evidently remove the cause of this disease, other kinds of treatment should be applied. Pain in the joints may be relieved by hot applications or the administration of some form of acetylsalicylic acid. Rest and sufficient sleep evidently promote essential nutrition. And the swelling and stiffness of the joints require massage, manipulation of limbs, and exercises at the right time, as the disease becomes relieved. Essential nutrition may also be promoted by increasing rest or physical activity. Consequently, abnormally lean patients are advised to refrain from activity and obtain more rest, and the obese to increase physical exercise.

III. THE PRACTICE OF ESSENTIAL NUTRITION AND THE CONTROL OF HEALTH

The relief of disease and the restoration of health through essential nutrition are brought about from right eating and living according to the control exercised by the proximal colon. To cure the disease, however, the health of essential nutrition must be subsequently controlled to prevent a recurrence. Fortunately, through a knowledge of the factors that irritate the colon and cause malabsorption, a failure of normal nutrient substances to build up the tissues may be generally prevented. To control health, patients and healthy persons learn how to eat to keep the dejections regular and normal. As an additional check on the nutrient substances entering the body, they should mark evening meals twice a month and make sure that the intestinal rate is normal. They should also weigh themselves every other week to avoid abnormal leanness or obesity. And finally, once every year they should get assurance that the most highly perfected organs and tissues are in good order by an exact and comprehensive health examination.

After essential nutrition has been established a maintenance diet of about 75 grams of protein, 100 grams of fat, 200 grams of carbohydrate, with the vitamines and essential minerals, is often consumed. On such a regimen, two muffins or a slice and a half of toast and butter, or a corresponding amount of cereal, and tea, cocoa, coffee, or milk may be ingested for breakfast. An egg or cheese dish, soup or stew, some kind of vegetable, a roll and butter, and fruit desert or salad may be eaten at lunch. And a soup, meat or fish, potato, two other vegetables, bread and butter, a simple dessert and fruit if necessary may be consumed at dinner. The amount and kind of food advised are somewhat dependent on the age, size, and physical activity of the person; and when these factors have been properly regulated, fruit is added to and subtracted from the food according to the absorption.

The control of health after psoriasis has been determined from a survey of one hundred and fifty private and charity patients. (5) Accurate information obtained from ninety of this number showed that twenty-five controlled essential nutrition and were cured of the disease. Another group of thirty patients were relieved of the disease, but failed to follow the requirements for the control of health and had a recurrence. A few of this number, after one or more attacks, have learned the futility of trying to be well without right eating and living, and have become healthier. And finally, in thirty-five patients who did little to improve their nutrition, the disease has progressed and has sometimes become complicated with arthritis. An accurate study of the control of health after arthritis has not yet been made; but from a knowledge of the arthritic patients cured, relieved, or not improved, the figures are similar to those of the psoriatic patients.

A TABLE ILLUSTRATING THE RELIEF OF VARIOUS METABOLIC DISEASES IN A FEW PATIENTS BY THE ACQUISITION OF THE HEALTH OF ESSENTIAL NUTRITION

Patient's Initials.	Sex and Age	Duration and Disease	Faulty Food Factors	Condition 1 mo. Weight. Feces Intestinal rate.	Condition 6 mos. Weight. Feces. Intestinal rate.	Condition 1-4 yrs. Weight. Feces. Intestinal rate.	Final Result.
A. H. I.	F 65	12 yrs. Arthritis	Eats insufficient food and takes laxatives.	Regular without physic. 106 lbs. Soft & formed 12-134 hrs.	Swelling and pain reduced. 103 lbs. Normal 87-158 hrs.	Normally active. No pain or swelling. 114 lbs. Normal 38 137 hrs.	Healthy
I. F.	F 54	1 yr. Arthritis	Eats too fast and between meals.	Less indigestion 151 lbs. Soft 20-38 hrs.	Less pain and swelling. 148 lbs. Formed 39-144 hrs.	No pain or swelling; normally active. 145 lbs. Normal 37-133 hrs.	Healthy
T. O'B.	M 31	2 yrs. Arthritis	Eats too fast, between meals and too much fruit.	No indigestion 145 lbs. Soft 36-97 hrs.	Less pain and swelling. 144 lbs. Formed 39-134 hrs.	Entirely free of pain, swelling and stiffness. 150 lbs. Normal 61-120 hrs.	Healthy
M. McL.	F 35	1-3 yrs. Arthritis	Eats too fast, too much candy and sweet stuff.	Feels better 167 lbs. Soft 13-110 hrs.	Stiffness disappearing. 163 lbs. Formed. 38-120 hrs.	Pain, stiffness and swelling gone. 158 lbs. Normal 42-123 hrs.	Healthy
M. R.	F 44	3 yrs. Arthritis	Eats no fish or meat and takes laxatives.	Regular without physic. 144 lbs. Soft 13-88 hrs.	Less pain and swelling. 153 lbs. Normal 38-112 hrs.	No pain or swelling. 150 lbs. Formed 38-93 hrs.	Healthy
W. D. H.	M 43	18 yrs. Psoriasis	Eats too much and too much starchy food.	Skin about the same. 153 lbs. Soft & acid 12-87 hrs.	Skin less red and spots reduced. 151 lbs. Normal 39-132 hrs.	Skin normal. 147 lbs. Formed 16-138 hrs.	Healthy
J. W.	M 48	20 yrs. Psoriasis	Eats too fast, too much, and takes laxatives.	Regular without physic. Skin about the same. 170 lbs. Formed 38-110 hrs.	Skin improved. 156 lbs. Normal 38-134 hrs.	Skin clear. 151 lbs. Normal 63-156 hrs.	Healthy
A. S.	F 25	10 yrs. Psoriasis	Eats too much candy and takes laxatives.	Regular without physic. Skin the same. 106 lbs. Soft 17-88 hrs.	No new spots. 109 lbs. Normal 39-158 hrs.	Skin normal. 110 lbs. Normal 61-155 hrs.	Healthy
M. G. R.	F 40	12 yrs. Psoriasis 2 yrs. Arthritis	Eats too much starchy food and citrous fruits.	Skin the same. 100 lbs. Soft 15-84 hrs.	Has less pain in joints. Lesion slighter in color. 99 lbs. Formed 36-108 hrs.	Skin normal; joints not painful or swollen. 99 lbs. 36-132 hrs.	Healthy
W. O. S.	M 39	6 yrs. Iritis	Eats rapidly and too much cereal food and meat.	Eyes less red. 192 lbs. Soft 19-43 hrs.	No indigestion now; eyes improved. 172 lbs. Formed 42-90 hrs.	Three years without an attack. 152 lbs. Normal 24-120 hrs.	Healthy
G. C. R.	F 42	7 yrs. Recurrent Iritis	Eats rapidly and too much sweet stuff. Dinner at noon.	Eyes normal. 161 lbs. Formed, neutral 24-118 hrs.	Iritis prevented. Indigestion relieved. 152 lbs. Normal 66-137 hrs.		Healthy

IV. THE ANABOLIC PROCESSES

. . . "In early life the anabolic, or building up processes should be in excess of the katabolic or destructive processes, so that growth proceeds through the assimilation and permanent retention of much of the food materials in the form of body tissue. . . . Substances taken in as food may be used directly for the building up of tissue, whereupon they become a relatively stable part of the body structure, or they may be burnt to produce energy, or stored for future burning." (6) A striking illustration of the variations in the building of tissue is seen in figure 3. This jaw bone was similar to several bones removed from guinea pigs after a dietary experiment. When young, these animals were fed a diet without vitamin C. Malabsorption occurred, as shown by the dejection of irregular and soft fecal segments. Then perhaps through a failure of essential nutrient substances to enter the body, there was malassimilation of the bone, and the poor, decalcified material seen in the anterior part of the jaw developed. When the animals were in this deficient condition, the food was made complete by the addition of vitamin C. Almost immediately, the malabsorption was relieved, as the fecal segments became formed and uniform; and with this kind of absorption there evidently developed strong, normal bone which appears to be growing over the decalcified material. (7) Such a sequence of events shows the relation between the food, the functions of the digestive system, and the building up of the tissues.

"The solution of our problem of life is a fuller knowledge of the use and working of those parts of our bodies most apt to give way under our modern ways of living—the use of such structures as the great bowel. And when we have replaced our ignorance by real knowledge we shall be in a position not to adapt our bodily structures to our mode of living but our mode of living to our bodily structures. . . . The great bowel is not a useless or superfluous organ, but one which we in our ignorance are maltreating." (8) In essential nutrition, the digestive system is regarded as a highly perfected nutritive apparatus and the ingestion

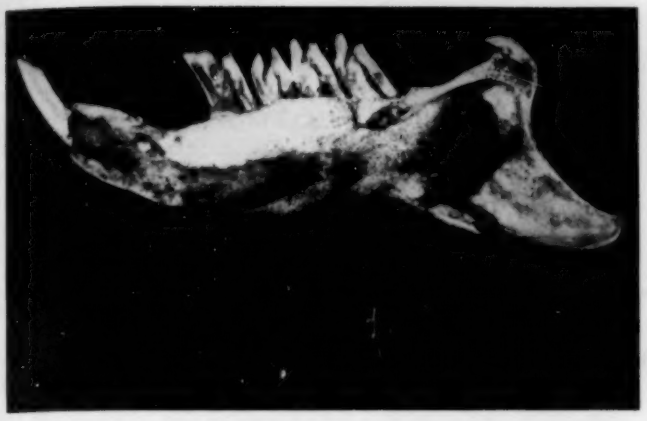

FIGURE 3. THE JAW BONE OF A GUINEA PIG SHOWING THE DEVELOPMENT OF A POOR, DECALCIFIED BONE, IN THE ANTERIOR PORTION, FROM A SCORBUTIC DIET, AND STRONG, NORMAL BONE, IN THE POSTERIOR PART, FROM A COMPLETE FOOD. (THE ILLUSTRATION IS USED THROUGH THE KINDNESS OF DR. PERCY R. HOWE OF BOSTON.

of food is made subservient to bodily action. This action signifies that the proximal colon has formed a secondary digestive pouch; because the intestinal contents are moulded entirely into segments. Such a function is known to be normal in the higher animals. (9)

And finally, that proper ways of eating and living may elicit a process that brings about an improved state of well being is indicated from the observations of an English colonel on a tribe that inhabit a remote part of the Himalaya Mountains. These people are "of magnificent physique, preserving until late in life the characteristics of youth; they are also unusually fertile and long lived, and endowed with nervous systems of notable stability. During the nine years of my association with these people, I never saw a case of asthenic dyspepsia, of gastric or duodenal ulcer, of appendicitis, mucous colitis or of cancer; indeed, their buoyant abdominal health has, since my return from the West, provided a remarkable contrast with the dyspeptic and colonic lamentations of our highly civilized communities." One of the reasons ascribed for the unusual degree of health is that the people live on the "unsophisticated foods of Nature," which consist of wheat, Indian corn, barley, milk, butter, eggs, green vegetables, and fruit. Sugar is a great luxury, salt is eaten sparingly, and their only beverage is water. Then again, meals are a ceremony, which they partake of but twice a day, and they do not bolt their food like many of the Western people. (10)

V.. CONCLUSIONS

Health has been a vague and variable state of the human body; but if the digestive system is regarded as a highly perfected nutritive apparatus, and food is consumed to fulfill the requirements of a complex and delicately adjusted function of the colon, an improved state of well being appears to be created. For when food is consumed sparingly in the fore part of the day, when it is thoroughly comminuted, complete, properly proportioned, and free of laxatives, oils, etc., the proximal colon forms a secondary digestive pouch, whereby the intestinal contents are finally moulded into uniform segments, to produce the presumably normal feces and intestinal rate. And, as the absorption of nutrient substances is evidently controlled and the assimilation by cells is improved through the action of this function, the state of well being created has been called the health of essential nutrition.

Furthermore, from a knowledge of this intricate kind of tissue construction, a subtle cause of disease appears to be revealed through the means to detect essential malnutrition, whereby nutritive material passes through instead of into the body. To apply these principles to the relief and cure of disease, patients are educated to eat according to the action of their own nutritive apparatus. Education is carried out by records on which they write out the food consumed, the time spent at meals, the time and kind of dejection, and a determination of the intestinal rate for a week. These records are examined every few weeks, the absorption as determined from the intestinal rate especially noted, and dietary changes advised. Patients with psoriasis, as well as those with arthritis, have been educated to acquire and control the health of essential nutrition with gratifying success. An improvement in the nutrition of the skin or joints occurs slowly. When these metabolic or deficiency disorders have been relieved by this treatment, however, recurrences may be prevented and the diseases cured by controlling the health of essential nutrition.

205 Beacon Street.

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Hydrotherapy in Mental Diseases

By Arthur H. Ring, M.D., Boston, Mass.

The use of water in the paleation and cure of disease is as old as man. From cave times men and animals have soothed their fevers and healed their wounds with water.

Of all therapeutic agents, water is the most universal, flexible and adaptive. It is simple to use, accessible and cheap. It may be used solid, as ice, liquid at all temperatures from 32° to 212° and as steam vapor; as a temperature medium for moist heat or cold no other substance can compare with it.

Before taking up some of the methods of using water in the treatment of disease let us look at some of the rules and precautions to be observed.

1. We must know the condition of the patient, especially his circulatory apparatus and his resistance, that is, his endurance or fatigability and his capacity to react, in other words, the state of his vegetative nervous system, in order to decide upon the severity of the treatment; for water used therapeutically is a powerful agent and like other useful remedies, such as drugs, can do much harm.

2. We must decide whether sedative, tonic or stimulating effects will be most beneficial to the condition under treatment, for, according to the procedure used, water can do each of these things admirably.

3. We must know the physiological effects of the various hydrotherapeutic procedures. Water at 96° F. is spoken of as neutral and is neither tonic nor stimulating. However, it is definitely sedative if the body is immersed in it for a fairly long time. You will recall that the average surface temperature of the normal skin is about 72° F., but varies according to the temperature and humidity of the environment, as well as the physical condition of the individual. The nearer the environment temperature approaches the internal temperature of the body (98.6°) the more work is taken off the temperature regulating apparatus and the more relaxed the vasomotor mechanism becomes, and the blood is also more evenly distributed. The nerve terminals in the skin carry back to the vegeative nervous sytem and thence to the cord and brain sedative impulses which serve to relax the muscle tensions and so have a quieting influence upon the body and mind. Perhaps this is why persons residing in warm climates are more listless and relaxed. At any rate, we have in medicine no better sedative than the prolonged use of water at a neutral temperature.

If now we apply water above 98° F. or below 90° F. we begin to get stimulating or tonic effects and at very extremes of temperature, hemostatic effects, and so greater care and judgment must be exercised in their use. Hot water, i. e., over 100° F., first stimulates the vasoconstrictors for a few moments, then paralyzes them, resulting in passive congestion of the skin, drawing the blood from the deeper tissues and causing blushing and an increase of slowly moving blood in the capillaries. If, on the other hand, cold water (60° to 80° F.) is applied over a short time (one half to two minutes) the same but more intense vasomotor constriction occurs with blanching of the skin but soon is followed in health by a tonic dilatation of the capillaries, active reaction in contradistinction to the passive reaction from hot water. The amount of active reaction that the patient gets from treatment is one way to measure the degree of benefit which he obtains from it.

The application of hot or cold water for its tonic effects is one of the best methods of reaching and toning up the vegeative nervous system which is really the basis of our mechanism of well or ill feeling. And since our feelings are the basis of our state of contentment, you can at once see what a potent agent water may become when intelligently used.

In all asthenic states and all nervous and mental diseases, with the exception, perhaps, of acute mania, there is a lowering of the tone of the vegetative nervous system with resultant ill feeling and disturbed bodily sensations. If the individual has a well balanced mind (i. e., a well developed and properly nourished brain) the condition resulting will be merely one of asthenic lassitude and fatigability—perhaps irritability, fatigability and depression. He will retain good insight into his condition and will cooperate in his treatment. This is the type of patient with which most of you at times deal.

On the other hand, if he has inherited, or acquired through disease, various toxins or chemical poisons, a loosely knit mind prone to misjudgments, he may readily put a significance upon these perverted feelings which is not a correct estimate or deduction. We cannot get his point of view because we have not the same bodily feelings and hence not the same outlook on life; the world—his world—is changed, and so he reads this change into his objective world, hence his delusions.

I cannot go into the psychological twists which may grow out of these misinterpretations. I desire only to emphasize the idea that they probably, for the most part, grow out of disturbances of the vegetative nervous system and its correlated endocrine regulators and that in the use of water we have a potent means of helping this state of affairs. Now, disturbance of the vegetative nervous system may be functional or organic. Dementia precox probably in its more severe forms belongs to the organic group, although as yet we have no pathological evidence beyond that of general organ inferiority. The organic diseases we may not modify; the functional

ones we can often cure and the stimulating, tonic and sedative effect of water is one of the simplest and surest methods.

I do not mean to convey the idea that it should be used to the exclusion of the other remedies but rather in conjunction with them. At our sanatorium, hydrotherapy has been in use in all chronic and many acute forms of illness since 1879, when Dr. Dio Lewis put in his famous Turkish baths. We have had recourse to all that modern medicine has to offer: hygiene, drugs, sera, electrotherapy and heliotheraphy but water remains our sheet anchor and no patient stays long at the sanatorium without receiving some form of hydrotherapy.

I used to wonder, when physiotherapeutic societies were first organized, why it was that I had so little to say about these methods, which I had been using so many years—even from boyhood. I know now. It was because we used none of them exclusively but always in combination. Hence, I was unable to say just what any one of them did when used alone.

One precaution I want to speak of before coming to methods. I have said we must know the condition of the patient's cardiovascular system before prescribing water treatment, and I would double the precaution in patients over fifty. If there is much arteriosclerosis, water of extreme temperatures from normal should be used with great caution. I am speaking now, not of local application, but of tubs and packs and medicated baths as the Nauheim. The reason for this is that the vessels being irregularly fatty or stiff are incapable of reacting evenly to the tonic effects and so we may get an uneven distribution of blood with congestion or anemia where it will do harm. If the coronary artery is sclerosed, and who can say at times whether it is or not, the sudden primary increase in blood pressure from complete submergence in extreme hot or cold water may prove harmful or fatal. In cerebral anemia from the tonic reaction stage, the treatment may provoke great excitement with increase of mental symptoms and exhaustion. So, while I would not say that water treatments are entirely contraindicated in these cases, I would advise proceeding with caution and giving specific directions to the person giving the treatment.

METHODS AND PROCEDURE

I will not attempt to make a complete list of hydrotherapeuthic procedures but only refer to those which I have found useful in my special work.

PROLONGED NEUTRAL TUB BATH

This bath is sedative, circulatory regulator, and eliminative.

Equipment.—1, A large tub; 2, a bath thermometer; 3, a sheet of canvas to cover tub; 4, a blanket to wrap patient in (if necessary).

Technic.—Draw a tub of water at 97° F. to the overflow. Put patient in tub and immerse as completely as possible. Force fluids, keep ice compresses on the patient's head and watch his pulse. If you have the patient's cooperation, this is easy; if not, as in some cases of acute mania, it may take from two to four nurses at first. Occasionally, a patient is so disturbed and resistive that he cannot be kept in the tub; then the pack may be substituted. If the neutral tub is used for insomnia, asthenic or cardiac conditions, twenty minutes to an hour, according to the reaction and comfort of the patient, is sufficient. If you are treating a disturbed mental state the time may be lengthened to two or three hours, twice a day, or given for several hours at a time. In this latter case it is well to take the patient out occasionally and apply lanolin or other heavy grease to the whole body.

In the extreme agitation of chorea, I have found the neutral tub one of the best sedatives. Dr. Klapp, superintendent of the Allentown, Pa., State Hospital, has had installed some batteries of three large tubs in which the patients can turn around sideways and thrash about, sit up, eat and smoke. Tubbing is an essential factor in any such hospital. A trained attendant is constantly on hand in the room.

Various control valves have been constructed to keep the water at an even temperature but none of them are absolutely dependable or even necessary. The thermometer in the hand of the attendant is safest. Restraint of the patient in the tub is only mentioned to be condemned. But a rubber or canvas sheet to cover the tub protects the patient and helps to keep the temperature even.

THE PACK

The pack is also useful as a sedative and promotes nutrition by stimulating metabolism. In some German sanatoria, it is customary to put all neurotic patients in packs at bedtime for the night. It has the added advantage (sometimes, however, a disadvantage) of acting as restraint by enforcing muscular quietude. It consists in placing the patient in a tight wet jacket. Dry packs, used as restraint, are not allowed by law in mental hospitals in this state.

Dr. Boris Sidis, from his experiments on sleep, pointed out that there were three main essentials: 1, Reduction of external stimuli to a minimum; 2, monotony of rythm as from the heartbeat or respiration; 3, bodily immobility or muscular quietude. He found that if he bound a frog by wrapping it in a gauze bandage, it promptly went to sleep.

The wet pack fulfills most of these requirements as soon as reaction sets in, that is from ten to twenty minutes. The surface capillaries dilate, giving off some of the body heat to the wet sheets. Reflexly, the nervous system is quieted by the action of the water on the end plates of the skin and the stillness of the body and quietude, and sleep frequently ensues unless the patient is too disturbed, mentally.

Equipment.—1, A single bed stripped of bed clothes; 2, a long rubber sheet; 3, two single blankets; 4, three single sheets; 5, a pillow covered with rubber sheeting; 6, a dozen safety pins, horse blanket size; 7, a basin of water at desired temperature—usually from the cold tap. It is almost impossible to give a hot pack with sheets. They cool too quickly in handling. If a hot pack is indicated, as in kidney conditions, blankets must be used in place of sheets and handled rapidly. Cold packs are contraindicated in most kidney diseases.

Technic.—Completely cover the mattress with the rubber sheet. Over this spread two blankets. Wring out the sheets in water. Spread one fully open, over blankets. The other two should be folded once on the long way and placed across the wet sheet, so that the top one will extend from the patient's neck to the buttocks and the other lap over and extend to below the feet. (In quiet or nonmental patients two or even one sheet may be sufficient.) The patient is now placed nude, in the middle of the sheets and the upper sheet wrapped rapidly about him, tucking it in so as to surround the arms (first on one side and then the other) and binding them to his sides. There is a knack to this. Next the feet are similarly wrapped. If patient is chilly, a gentle slapping may be applied all over. Then the under sheet is neatly wrapped and folded about the shoulders and neck and feet. Finally, the blankets are brought over and around the patient, folded neatly and pinned at foot intervals for the entire length. Place a hot water bottle

to the feet and an icecap to the head and watch the pulse. The patient should warm up and become quiet. However, he should not be left alone at first, as some patients, if weak, may suffer from shock and require a hot drink or even aromatic spirits of ammonia or have to be taken out, but this is a rare occurrence. The patient may be kept in the pack for from one to three hours (which is the longest the law allows). He must be taken out, rubbed with a coarse towel, or given a warm sponge bath in cases where it would not excite the patient, then put to bed if quiet enough. Of course in cases of acute mania the patients often want to be up and doing and will not rest.

HOT SPINAL FOMENTATIONS

This is another procedure of great use as a sedative in mild cases of nervousness and at night for insomnia.

Equipment.—1. Some coarse kitchen toweling made up like a roller towel about two feet long with two sawed off broom handles inserted in the ends. 2. A piece of old flannel blanket about eighteen inches wide and as long as the patient's spine, folded to six inches in width. 3. One small blanket folded to cover the back. Bath towels may be used in place of both of these but do not hold heat as well. 4. Some boiling water.

Technic.—The folded blanket or towel six inches by twenty-four inches or so is immersed in the boiling water and placed in the wringer, the two ends being twisted until it is fairly dry and steaming. In this condition it is carried to the bedside and, with the patient lying comfortably on his face, is taken out of the wringer and laid, gently at first, along the patient's spine from neck to sacrum and quickly covered with the dry blanket or towel. The hot towel is changed every five or ten minutes when it gets cool for three to six times. The back is then dried and the patient left comfortable for sleep. No procedure except, perhaps, the deep therapy lamp, will help backaches so rapidly and the hot spinal compress is certainly preferable in insomnia. In acute colitis it helps wonderfully.

The tonic and stimulating treatments all have for their object the creating of an active hyperemia, rather than the passive one produced by the foregoing methods. Three factors are involved, 1, the time or duration of application; 2, the temperature, and 3, the pressure. While many of these treatments may be given at home most of them require special apparatus in order to obtain the best results.

THE SHOWER OR NEEDLE BATH

The mildest stimulating treatment is the simple rain or body needle douche. In the home the pitcher pour on the spine may be used while the patient sits in the tub. The rain shower is turned on at a comfortable temperature and gradually over a minute or two is run as cold as the patient can stand it. He is then briskly rubbed down with a bath towel.

The shower may be preceded by a few minutes in the electric light cabinet to warm him up and various degrees of heat and force of shower may be used according to the endurance of the patient.

The stronger patient may come from under the shower and be vigorously rubbed with ordinary table salt and then return to the shower when he rubs the salt off as the water runs cold. He is then dried. This is a very stimulating treatment and leaves a great sense of well being. It is called the salt glow because it leaves a very active hyperemia. As a general tonic it has no equal.

SCOTCH DOUCHE

This is for the more robust cases and is especially useful for alcoholics. The patient is placed in the electric light cabinet, his feet in a foot tub of warm water and a towel wrung out in ice water about his head. Here he remains until he perspires profusely (ten to twenty minutes). He then goes under the warm shower to rinse off. The hot (105°) and the cold (65°) hose is next turned on and played upon him alternately beginning at the feet and slowly working over the entire body. Then twenty to thirty pounds of pressure (about street pressure) is used at from a distance of from twelve to fifteen feet for two to four minutes. This massages the tissues and produces an active and deep hyperemia which greatly relaxes restlessness and produces a comfortable glow and quickens metabolism.

I believe that there is no procedure in medicine which so well reestablishes functions without any unpleasant or harmful reaction—excepting, of course, exercise and this should be added, through the day, in the form of walking, medicine ball, etc.

I might describe many other methods of applying water in disease but these are the ones we have found especially useful.

When we are dealing with sluggish or otherwise disturbed functions and local congestions, as we do in practically all nervous and mental conditions, for the trouble is often as much or more in the body than in the mind, and in toxic states, especially in the bowels, there is no single agent that alone or in combination will give such satisfying results as water properly used.

Arlington, Mass.

The Treatment of Injuries by Methods of Physical Therapy from the Viewpoint of the Surgeon

By Robert H. Kennedy, M. D., New York, N. Y.

Read before the New York Chapter of the American Physiotherapy Association, Dec. 8, 1931

The machine age, the automobile and the aeroplane have added greatly to the number of injuries both mild and serious. Until recent years, no particular interest was taken in the injured man. In private practice he was treated by the family physician, in the hospital by the interne. The members of the visiting staff of the hospital were glad to go at night to attend a patient suffering from acute appendicitis, while a broken leg or a cut tendon could be cared for by an interne or its treatment be postponed until rounds the following day. To be sure, there is greater danger of death from appendicitis than from the injuries mentioned. Of the 96 to 98% of the appendicitis patients who recover, however, few suffer any subsequent disability. This is not true of the majority of patients who have sustained injury. Shortened or deformed extremities, stiff joints, disabled fingers have been the expectation rather than the exception. This is for the greater part unnecessary and the public and the medical profession are gradually becoming aware of it. One of the evidences is the rapid growth of physical therapy departments in hospitals, insurance clinics or separate institutions. Any type of treatment that offers shorter temporary and less permanent disability to the injured man is to be given serious thought. Why and how does the surgeon expect assistance from physical therapy and what does he think of the current methods in vogue?

It is necessary first to consider briefly the pathology of injury and the process of repair. We shall omit reference to cuts and abrasions as rarely lending themselves to the use of physical methods. Contusion results chiefly in injury to blood vessels. If near the surface, this is evidenced by a black and blue area; if deep, by swelling, pain and tenderness. That is, blood has left the vessels and is free in the tissues. It clots rapidly. The process of repair is largely one of absorption of the clotted blood. New vessels must replace those destroyed. Fibrous tissue may be formed in the blood clot if it is not absorbed rapidly, with possible persistent thickening or adhesion of otherwise movable parts.

Sprain means tearing of ligament or muscle. Here again there is usually bleeding, often evidenced externally by ecchymosis and extravasation of tissue juices. If the part is at rest, a blood clot forms between the injured portions of ligament or muscle almost immediately. Connective tissue commences to grow into this clot from cells at the margin. Nature rushes in her repair elements, often far more than are necessary, with increasing soft swelling from fluid. If edema is allowed to remain, there results prolonged or permanent stiffness. Protection is necessary until ligament or muscle has been effectively united, usually a matter of at least two and a half weeks.

The process is virtually the same in a fracture. Immediately after the bone is broken, blood and tissue juice pour out from each end, fill the space between the ends and push out into the surrounding tissues, raising periosteum from bone, pushing muscle aside, etc. Naturally, soft part injury usually accompanies the fracture so that contusion and sprain as described above are also present. Nature starts her repair work immediately, not waiting for the fracture to be reduced. Clotting takes place between and around the bone ends. Connective tissue starts to grow into the clot from each end. This is replaced by callus and in due time sufficient bone salts are deposited so that the fracture is converted into united bone. Nature does not stop here but keeps at her work until this new bridge of bone has taken on the character of normal bone structure as closely as possible with its canals, whorls according to lines of stress, etc.

In addition, as occur in sprains, tissue juices pour out into the surrounding soft parts, with subsequent replacement by fibrous tissue, unless methods are employed to prevent them. Muscles are naturally in a state of balance between flexion and extension. If a part is immobilized, muscle functions little, its tone becomes poorer and it gradually weakens. Thus it is important to keep the part in such a position that the stronger rather than the weaker muscles are on the stretch. For example, the posterior leg muscles entering the tendon Achillis are much stronger than the anterior muscles. If footdrop position is allowed in a splint, it is more difficult for the anterior muscles to regain their function of contracting to flex the ankle against the power of the tendo Achillis. If the foot is kept at right angles to the leg, the strong Achilles tendon is stretched during the treatment but rapidly regains its power of contracting after the splints are removed. Compound injuries and damage to nerves and large vessels will not be considered in this discussion.

All our efforts should be exerted to assist Nature and not to interfere. The process of repair is active from the moment of injury except perhaps for outside in-

terference. Among the latter the surgeon is often to be implicated. Treatment should be instituted at the earliest possible moment. This means splinting the fracture effectively before the patient is moved. Effectively means the use of traction methods in the majority of extremity fractures. If not splinted effectively, fragments will move, causing the breaking up of clot, the outpouring of more blood, and increased damage to the surrounding parts. If fragments are overriding, Nature does her own splinting by muscle contraction which increases the overriding, thereby lessening the arc of movement. Traction overcomes this and assures easier reduction and less disturbance of the processes of repair when reduction is done. Whenever the position of the fragments is changed, the process of repair is disturbed and must start anew.

On the basis of the pathological changes in injury and the physiology of repair, what assistance does the surgeon wish from the methods of physical therapy?

1. To hasten the laying down of new tissue. The processes of repair outlined above can proceed only through the local blood and lymph supply brought through the general circulatory system. Part of this supply has been damaged by the injury. The remainder must be assisted to carry an extra burden.

2. To carry away waste matter. An injury means that some cells are destroyed. This dead tissue must be carried away. Increased demand on the circulation is made to accomplish this.

3. To increase local heat. There is reason to believe that within certain limits increased heat aids the processes of repair in other ways than mere dilatation of vessels, possibly by some effect on the temperature of the chemical process.

4. To prevent stagnation in the parts. Edema, if present, must be removed as rapidly as possible.

5. To relieve pain. Often more is accomplished by local treatment than by sedatives.

6. To maintain muscle function. Not only is this worth while for its own sake, but also active use of muscle is one of the chief means of obtaining adequate blood supply to an extremity.

7. To maintain joint function. If early motion at the joints on either side of a fracture can be obtained without endangering the proper healing of a fracture, the length of disability both for joint and patient is diminished.

8. To maintain the patient's morale—to have the patient feel that something is being done for him and to secure his cooperation in the doing of it.

All of the above aims are present from the moment the fracture occurs. But there are many fractures and sprains which are not seen until after undesirable events have taken place. Massive edema with or without unreduced fractures requires persistent treatment. One should never wait until the swelling disappears before reducing a fracture. The aim should be to obtain reduction before edema appears. If present, the quickest way to diminish the swelling is to reduce the fracture and return the soft parts to more nearly normal relations. If muscles have been allowed to shorten, joints to grow stiff, the soft parts to be bound together by fibrous tissue, treatment has to be aimed at the repair of poor surgery. At present I fear that more physical therapy treatments have to be given on this basis than on assisting the natural repair of the lesion. As initial surgical treatment of fractures improves, we feel that the physical therapist will have to spend less time on joint and muscle contractures.

I have tried to show you what happens in an acute injury and what the surgeon thinks will facilitate early return of function. I do not know what you think the various modalities do from the viewpoint of physical therapy. It may be of interest to you to know how a surgeon views the various methods in the light of the above aims.

1. *Position of the Injured Part.* Elevation of an extremity in sprain or fracture is important. Gravity will do much to prevent and relieve edema. A patient lying in bed with an injured lower extremity does not need a pillow under the leg, but some arrangement by which the extremity is raised as far above the body level as is physically practicable. A fractured wrist should not be resting in a sling all day but considerable time should be spent with the arm abducted to 90°, e. g. standing with the elbow resting on a mantel piece or sitting with the arm on the back of the chair. This will help venous and lymph return and relieve stagnation.

2. *Heat.* In contusions, cold should be used for the first 24 hours. Vessels have been ruptured and application of cold, e. g. by ice cap, will shrink the superficial vessels thereby decreasing the amount of extravasation and resulting ecchymosis. My objection to heat at this time is that theoretically, at least, it dilates the vessels and increases extravasation. After the first 24 hours, if the condition is severe enough to require treatment, use heat. Wet dressings are objectionable since they rapidly dry. If immersion of a part is used, it means that the injured extremity is hanging down whereas elevation is even more important than heat. Radiant heat by electric lamp is the preferred treatment in most cases.

In sprains also, cold is usually preferable for the first 24 hours. There is an added reason here in that cold relieves acute pain in more people than does heat.

In fractures, heat should be used from the first. We are dealing with a deeper, more extensive lesion and if there should be an increased extravasation it will not materially alter the progress of the case. It is more important to aim from the outset to speed repair, carry away waste products and prevent edema. Heat as applied by the physical therapist is only an aid to the value of massage. Ten or fifteen minutes once or twice a day by a thermolite is not what I mean by heat. The part should be kept somewhat above body temperature through the whole 24 hours by means of a covered cradle with electric lights.

3. *Massage.* There is considerable difference of opinion in regard to the value of massage. Some men experienced in the treatment of fractures state that massage is contraindicated. I cannot subscribe to this doctrine. One states that it causes pain and prevents the proper rest needed by the part. Certainly any kind of massage which causes pain in an acute injury is contraindicated. Other men believe in superficial and deep massage before healing has taken place. I can not follow them either. A middle course is, I believe, safe and of value. Superficial massage should be started on the day of injury if the part is exposed or as soon as plaster, if applied, can be safely removed. One great advantage of molded plaster splints over circular plaster bandages is that they are removable for heat and massage. If possible, this superficial massage should be applied more than once a day. It is sedative, increases circulation and diminishes waste products and edema. Deep massage has no place in treatment until solid union has been obtained. The responsibility of interfering with healing or even actually moving bone fragments is too great. Blood clots may be loosened and embolism occur.

Superficial massage is of value in sprains and some

contusions, but here also deep massage is contraindicated.

4. *Active Motion.* Active motion, provided it does not cause pain, is the most important physical method of treatment in acute sprains and fractures. By active motion I mean that which is accomplished entirely by the patient's own efforts. It requires no particular persuasion for the patient to use no range of motion beyond that where pain commences. Pain is the natural warning that continuation of movement along the same line will cause damage. The patient does not resist physical motion which he makes himself. Let someone else lay a hand on the part and his protective mechanism immediately becomes evident with resistance of all the muscles in the region. Motion now becomes neither active nor passive, but resistive. It is an exceptional person who can relax completely for passive motion, and even this person can almost never do so in the presence of acute injury. Although the technician does not touch the part, his function in guiding active motion is all important. It must be appreciated what motions are allowable. For instance, in an ankle sprain the ligamentous tear is on the outer or inner side, or both, not anteriorly or posteriorly. Therefore, active flexion and extension at the ankle can do no damage and are to be insisted on, while no inversion or eversion of the foot should be allowed until sufficient time has elapsed for healing of the torn ligaments. Movement of all muscles of the part is to be insisted on if there is no contraindication. For example, in Colles' fracture the splint should leave the metacarpophalangeal and all the finger joints free. By guiding motions of all these joints there is muscle contraction of a considerable portion of the bulk of muscles in the forearm. This increases the circulation of blood in the whole forearm and so in the region of the fracture, as well as keeping the joints free and preserving the precision movements of the fingers. When removal of the splint is allowed, it is advisable to support the site of fracture with the fingers so that movement of the fragments can not occur and have the patient move the wrist actively, but not against gravity. Active motion so far as possible should be commenced on the day of injury. Each day that joints are held immobile is liable to increase the time before return to normal function. There is nothing that serves so efficiently to dissipate edema as active guided motion. In addition to the physical improvement brought about by obtaining the patient's cooperation in active motion, the psychic effect plays a real part in promoting early function. Many patients, once having been trained, show a great interest in demonstrating throughout the day how much they can do for themselves.

5. *Passive Motion.* In acute injury I mention passive motion only to condemn it. In the case of fracture it has absolutely no place at least until the bone is solid. As stated above, passive motion on such a patient is really resistive motion. I do not care how perfectly trained or adept a masseur may be, he should not be given nor should he accept the responsibility of moving the joints either side of a fracture until union is absolutely solid. This holds true whether the surgeon administers his own treatment or turns it over to the technician. Fragments may be moved, processes of repair may be interefered with, pain may be caused, muscles may be overstretched causing spasm, and even if none of these occur, it is valueless. It is preferable that the joints adjacent to a fracture should never move until the bone is solid than to have any passive motion employed. In addition to consideration of the welfare of the patient, one must also appreciate the frequency of malpractice suits in fracture cases and not lay oneself open to the possibility of increasing the damage done by the original trauma and thereby incur legal liability.

After union has taken place, passive motion should not be necessary if proper treatment has been given during the earlier stage. Unfortunately, under present day treatment it is needed all too often to break up adhesions due to the fact that edema has not been dissipated early, to stretch muscles which have been allowed to contract in poor balance, and to mobilize joints which have become fixed by lack of use or by edema. But remember that you are not treating the results of the injury but the unfortunate results of treatment or lack of treatment. Here again cooperation of the patient is most important. Firmness with gentleness is necessary. Forced stretching does more harm than good, both physically and mentally. Muscle and ligament are sometimes actually torn by forced stretching, prolonged pain is experienced, spasm of muscle and even ecchymosis occur. If a patient comes for treatment with a feeling of fear, something has been wrong with previous treatment. Passive motion in young children is almost always quite useless as they can so seldom cooperate.

6. *Electrotherapy.* Diathermy has been used in cases of injury with the idea of supplying heat to the deeper parts. In a fracture, by increasing the circulation it was expected that waste products would be carried away more rapidly and more bone salts brought to the part. As a matter of fact, we have no evidence that the amount of calcium or phosphorus in the diet or the blood has the slightest effect on the rate of healing of a fracture. Probably the bone salts used in repair are obtained locally from the bone which degenerates at each end of the facture as a result of the injury. To increase the local deep heat is just as liable to mean that bone salts are carried away more rapidly from the site of injury as that more calcium and phosphorus are deposited there. From the practical point of view, I watched the effect of diathermy on a large number of fractures over a period of about two years. In some I thought healing was hastened. In others, although the X-ray showed callus formation progressing normally before diathermy was commenced, I saw in the X-ray definite absorption of callus and clinical union become less firm while diathermy was being used. I believe it is impossible to forecast what its effect will be on an individual patient and I have therefore discarded its use entirely.

Static has a definite value but should not be used until solid union has taken place for the reasons mentioned under deep massage. The Bristow or Smart coils in thoroughly trained hands are of real assistance in maintaining muscle function and lessening disability time.

7. *Hydrotherapy.* Many forms of hydrotherapy are useful in the late treatment of injury. Hot baths, the Scotch douche and particularly the whirlpool bath are valuable in late edema, and to restore muscle, tendon and joint function.

8. *Exercise.* Reeducation of muscles and joints by means of occupational therapy and gymnastic apparatus of various types is of value in the late treatment of many of the more serious injuries. The possibilities in this field are not sufficiently realized. They can never become standardized but require in-

genuity on the part of the operator and close interest and instruction in each individual case.

I have often heard it stated that treatment in general may be divided into three parts: medicine, surgery and physical therapy. Each of these is a separate field. If a surgeon believes that physical therapy will help a patient, he should turn the treatment over to the physical therapist and leave to him the modality to be used. I do not agree with this in fracture treatment. The surgeon who reduces a fracture must be responsible for its after care. He only should decide when active motion is to be started, when one or all splints may be removed for massage, when passive motion is needed and safe, when active exercise without retentive apparatus may be attempted, etc. The physical therapist should not allow this responsibility to be thrown on him, but should insist that the surgeon give definite instructions at frequent intervals as to how far he may go.

One warning must be given which is more pertinent to the surgeon than to the physical therapist. Particularly in compensation patients we often see physical therapy continued for too long a period. Each treatment makes the patient feel better. As long as he is under treatment he does not have to return to work. In our interest in improving his local condition we are likely to fail to see that the gravity of his injury is increasing in his own mind. Many patients when told that they are ready for discharge will try to insist on obtaining more treatment. A neurosis has developed under our eyes and may take longer to cure than the original injury. The physical therapist should insist that all patients be seen by the surgeon at least once a week and they should discuss the progress, change in indications, and time when the maximum improvement has been reached. Nothing is more inimical to the progress of physical therapy than to have the patients remain under treatment for too long a period. A man who has broken his leg and recovered to the point where he walks on it a mile a day does not need to come to a clinic for heat and massage. Often a man is receiving treatment by physical methods when what he really needs is a neurologist.

Having before us an injured man, our aim is to return him to society and industry restored to his previous condition anatomically, functionally and economically, as nearly as possible, and in the shortest time. Cooperation between the surgeon and the physical therapist offers the patient the best chance. Only by an open minded attempt of each to get the viewpoint of the other and meet on common ground can the injured man obtain the full advantage of modern treatment.

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(Continued on page 168)

The Training of the Birth Injured

By Earl R. Carlson, M.D., Director of Reeducation Clinic for the Birth Injured, Neurological Institute, New York

Very frequently at birth small hemorrhages in the brain damage it so that the child is incapacitated for life. Such a child is unable to control his muscular movements and is often considered mentally deficient. In reality he may be mentally bright. Such afflictions can be described if we picture the mind as a telephone switchboard. The message is flashed and though understood by the muscular and nervous system, the command cannot be carried out because of a breakdown somewhere along the line. They have the machinery but can't deliver. There is too much power behind the machine. The problem therefore is to find adequate means of expression for this excessive energy. Just as writing, speaking and certain gestures are conventional modalities of expression, gained through the proper training of the normal individual, so the muscular movements of the birth injured come to represent unconventional modalities of expression unless proper conditioning is instituted when the child's associative system is largely unformed. The purpose of this paper is therefore to emphasize that training of the birth injured is not merely a matter of muscle training; it is an educational program in itself and demands the closest cooperation between physician, physiotherapist, teacher and parent.

Since the inflammatory processes, tumours, and the progressive degenerative diseases of various types also play a rôle in simulating the clinical picture of intracranial birth injury it is essential before prescribing training to differentiate the fixed, non-progressive types of disturbances from the progressive. In the presence of a cerebral neoplasm it is obvious that much harm might be done through a long period of muscle training, because the successful removal of the same depends upon its early recognition, whereas prolongation of muscle training would only tend to obscure its early manifestations. Infantile cerebral palsy is known to have occurred as a sequel of encephalities following infections, such as measles, mumps, chicken-pox, scarlet fever, whooping cough and septic sore throat. Muscle re-education holds very little in store for such cases unless the inflammatory process is arrested. The progressive degenerative diseases are likewise not ameliorative to muscle training. It is important therefore in every case to get as nearly complete a history as possible. When the disturbance is due to a birth injury we are fairly certain that we are dealing with a non-progressive type of lesion.

There are many causes of cerebral birth injury. Intracranial hemorrhage is known to have occurred in normal delivery, in Caesarian section, and in precipitate delivery, as well as in parturition accompanied by instrumentation. In precipitate delivery the head is sometimes pushed through the birth canal with such rapidity that there is not time for moulding and the vessels bleed from being suddenly distended. The delicate vascular system of the premature infant predisposes to intracranial hemorrhage even if delivered normally. The thinness of the premature infant's skull subjects it to excessive moulding and intracranial damage. The hemorrhagic diseases of the new-born, the toxemias, and various diseases of the fetus also play a role. Asphyxia, such as occurs under prolonged interference with the fetal circulation, as a cord around the neck, is known to have caused multiple hemorrhages of the brain and meninges.

The attention given to re-education in conditions arising from intracranial birth injury is practically nil in comparison with the efforts of re-education in other directions, as in the training of the lame, the deaf, the dumb, and the blind. The result is that the training of cerebral palsies is frequently approached with an attitude of extreme pessimism—an attitude not altogether warranted.

The birth injury group embraces a wide variety of conditions, and although among them are the more serious idiotic cases, in which prognosis is hopeless, and for which there is no effective treatment, we also have a large number of cases laboring under purely motor handicaps, with little or no mental disturbance and in which there is a possibility of obtaining extremely good results if proper treatment is instituted at an early age. The essential factor to be determined is whether the disease is progressive and whether any degree of mentality is present. Evidence that the disease is progressive places the case beyond the reach of effective training: a profound degree of mental defectiveness excludes the case because there is no undamaged residue with which to work. Obviously, if there is to be re-education, something must be present that can be educated, or trained to compensate in some way for what is gone. In the case of the blind, the lame, the deaf, and the dumb, these compensating factors are readily determined. Such people are capable of average normal education and can become socially useful if they are guided into activities suitable to their abilities and where their handicap will not prevent their doing satisfactory work. As long as the mentality remains intact the possibilities of re-education are unlimited.

In the case of the birth injury, however, the tendency is to over-rate the handicap and to undervalue the undamaged residue. The grimaces and drooling frequently seen in these patients have not infrequently led to their being mistaken for idiots or considered feeble-minded, whereas such a condition should no more be a criterion of mental defect than is a disturbance limited to a leg or foot muscle. Undoubtedly this accounts for the large

number of patients suffering from motor handicaps to be found in institutions for the feeble-minded, many of whom might, through the application of proper re-education methods, become assets rather than liabilities to society. If many cases of this type are harbored in institutions, doubtless many more could be found in families, where they remain a life-long burden to parents and guardians.

The disturbances arising from intracranial birth injury are referred to as Little's disease, cerebral diplegia, athetosis or spastic paralysis. They are really not a true paralysis in the ordinary sense of the word, as meaning loss of motion or sensation in a living part or member. Instead, there is an exaggerated motion, and often the musculature is surprisingly good, so good, in fact, that certain groups of muscles become stronger than the opposing ones, resulting in rigidity and various forms of contracture, the legs becoming crossed on each other on attempts to walk and producing a scissors gait. The movements are greatly exaggerated. In reaching for an object the arm will wander aimlessly. The hand in attempting to grasp an object, may remain fixed in that position and is relaxed with difficulty. In the early years the patient cannot support himself, and even with support, the rigidity of the lower extremities prevents walking. As time passes, the patient may learn to walk after a fashion, and the gait is quite characteristic, the toes scrape along the floor, the heels not brought down, and the spasm of the thigh muscles forcing the individual to progress in a cross-legged fashion. There is sometimes difficulty in swallowing because of spasm of the pharyngeal and tongue muscles. Speech is difficult, and not infrequently profuse salivation with drooling tends to reflect against the normal mentality of the patient. In spite of the disability brought about by the disturbance the mental state usually remains normal. The extreme overflow reaction accompanying attempted voluntary movement causes the patient to become very apprehensive and adds further to the excursions of his adventitious coordination. In the same individual the reactions to this overflow on some occasions may not be apparent, or may be limited to only one or two muscle groups, while at other times the entire body musculature is thrown into a chaos of writhing movements with such violence that one would think the entire store of volitional impulses within the central nervous system had been set loose. The emotions exert a profound influence in enabling the patient to gain control over them. Excitement and unpleasant emotional reactions aggravate the spasm, while agreeable environment enables the patient to gain almost perfect control of bodily movements.

It is a condition analogous to that which the stutterer experiences, except that with the latter the spasm is limited to the lingual and palatal muscles, whereas with the birth injured every muscle of the body may be involved; and just as the stutterer is apprensive in talking, so the birth injured is even more anticipatory in his movements, fearing that the muscles other than those intended will be brought into play and spoil the accomplishment of the act. He may experience very little or no disturbance when working alone and have almost perfect control over his movements, but when obliged to perform under observation he may be so apprehensive that the extra effort to control the overflow results in great fatigue, and not infrequently adds so many more stimuli to the already overcrowded sensorium that the bodily reactions end in a whirl of confusion. It is only through repeated trials and a determination to surmount the shortcomings that the patient gains confidence and gradually develops increasing muscular dexterity. Failure to appreciate these facts deprives society of the services of those who might be useful citizens.

The progress of a patient who, in spite of his handicap, has to some extent already learned to make his way in the world will depend largely upon his ability to cope with the overflow reaction. It either drives him into despair or isolation, where he can live apart from society and build an imaginary world of his own, with the resulting mental deterioration which such an environment imposes, or he will face the world of reality with all his shortcomings and endeavor to establish something which will compensate for his inefficiencies. As this compensating mechanism develops, he begins to feel that he is an integral part of society instead of an ostracized member. His greater assurance and confidence will make him more oblivious of his condition and less apprehensive of his shortcomings, all of which tend to minimize the sensorial input with a consequent increase in equanimity. In other words, it is the fate of the overflow which determines progress. It either goes to waste in the continuance of adventitious muscular movements and the patient succumbs to his environment, or the overflow is utilized by being directed into channels where it becomes productive.

The problem then is to find adequate channels of expression for the accessive energy which interferes with the birth injured's activities. The solution of this problem rests in early conditioning. Every habit is built up by repeatedly associating one type of stimulus or response with another specific type of response of stimulus. For example, we wish to train a dog to come for his food at the sound of a spoon tapping on his food plate. We tap the plate and present the food, repeating the procedure at suitable intervals until the sound of the tapping is associated in the dog's mind with food, and he comes at the sound of the tapping even though he can not see the food. A purely artificial stimulus (the sound of the spoon tapping the plate) has been linked up with a natural stimulus (food). He has formed the habit of associating the sound of the tapping with food. This habit can be strengthened by giving the dog food every time the plate is tapped, and can be weakened by repeatedly failing to produce the food when the dog comes in response to the sound of the spoon on the plate.

In the birth injured, in a similar way, where the emotional element lends itself so readily to expression in the form of adventitious muscular movements, it is important to disassociate the emotional factor from the muscular act in order to establish the correct motion concepts, which are essential in the production of normal coordinated movements. Before these motion concepts become formulated the merest effort on the part of the patient to move a single muscle group will often set the entire musculature in a spasm. With such a mass action toward various stimuli in the environment it is obvious that the type of conditioning to which such a cripple is submitted is a matter of great importance. By means of muscle training carried out in a quiet businesslike atmosphere it is possible to break up this mass action into a segmental action. The training is first directed toward obtaining relaxation and then gradually exercising, various groups of muscles, beginning first with the proximal joints, the shoulder and the hip, with the aim of gradually working in the knee and elbow and finally the hands and feet, and always bearing in mind when working with a single muscle group to avoid as much as possible an overflow reaction into the adjacent groups of mucles.

The training, much the same as that for the normal person in acquiring skilled acts, requires repetition for the coordinated movement to become automatic. To be-

come adept in learning to play the piano, the violin, or to paint, or to swim, it is necessary regardless what the intelligence of the person may be, that he first adapt his motor centers to these specific exercises. Adaptation of the motor centers to these exercises by gradually and progressively coordinating the sensory impulses with the musculature contractions until more and more harmonious relation is developed between the conscious perception and the volition. The conscious knowledge of how to paint or play is of no value unless same is productive. The only way to make the conscious knowledge productive is by training, practice and study. This aptitude of course varies between individuals in accordance with their intelligence, their training and the value they derive from this training.

The ideal in training of birth injured would be to place him in a special school as soon as the disturbance is recognized, where mental and muscle training work could begin and proceed simultaneously with a minimum of distraction from a definite daily routine. One hour daily should be allotted to muscle training followed by an hour of relaxation and during the remainder of the waking day patient should be kept occupied by studies and such games which would tend toward enhancing coördination. Care should be exercised in the selection of patients; cases of marked mental deterioration and those showing progressive disturbances should be excluded. A close contact with the home must be kept to make certain that the parents are cooperating in the program which in the main should tend to make the child self attendant. This is necessary to augment rather than to distract from the influences of the special school. Emphasis must be placed on the fact that when the child is ready he should be transferred to a normal school environment.

Deprived of early training, the patient is not only delayed in speech, locomotion, and the performance of skilled acts in general, but the longer the delay, the slower will be the progress because of the faulty motion habits to be unlearned. Only through repeated exercises does the patient gradually acquire a facility for pattern delivery that calls into play the minimum of musculature effort. Such training demands the closest cooperation between trainer and patient, and one may wonder if the gain is worth the expense and effort. However, when one considers all the waste among those not physically handicapped and who, in spite of educational opportunities, do not make good citizens, it does not seem unresourceful to devote more attention to the birth injured, many of whom, with proper training might excel the average citizen.

Convention Side Trips

In connection with the regular annual tour offered to American physicians, full details of which are announced in the January issue of the "Archives of Physical Therapy," this year a shorter tour to Paris and Vichy has been arranged under the auspices of the French Government's Tourist Office as a special courtesy to members of the American Congress of Physical Therapy. It is not, however, restricted to members of the Congress, but inasmuch as the eleventh annual convention will be held in New York immediately following the return of both tours, the privilege of inviting others who are not members of the American Congress of Physical Therapy has been extended.

This trip includes all transportation and entertainment from the time the participants leave New York until their return. All sightseeing trips in Paris and a special trip to the battlefields, as well as other trips to places of historical interest around the city of Paris, are included. Moreover, all meals, hotel accommodations, wines and tips are provided.

Sailing on the famous new steamer of the French Line, the S. S. "Lafayette," on August 6th, the party will arrive in Le Havre on Aug. 13. A special private train will be provided to transport the entire party to Paris. In Paris the entire party will be accommodated in rooms with baths at the Hôtel Continental, which is opposite the famous Tuileries Gardens, across which one can see the Palace of Louvre.

An entire week will be spent in Paris, where sightseeing trips will be conducted, including, as mentioned, a trip to the battlefields. Entertainment will be provided, including a special banquet to Professor d'Arsonval, who is the "father of modern electrotherapy." This will also be attended by other wellknown French scientists who are interested in the field of physical therapy. Interrupting the stay in Paris there will be a trip on a special train to Vichy, where the entire party will again be accommodated in one of the first class hotels. While in Vichy special opportunities will be afforded the party to see all the phases of the life at this wellknown Cure. Demonstrations and lectures on medical treatments will be given and there will also be an official banquet tended by the city and a party at the Opera. Those who desire to play golf will have an opportunity to get some exercise while spending the three days in Vichy and the ladies of the party will have a chance to visit the branches of the famous Parisian shops.

It must be remembered that August is the height of the season in Vichy and it is a great compliment to the visiting doctors that the Government's Tourist Office will arrange for a tour to visit Vichy at that time of the year.

Returning to Paris for a few days more, the party will have an opportunity for more sightseeing and will leave by special train for Le Havre, returning to New York on the newly refurnished S. S. "Paris," sailing Aug. 24.

Special attention is drawn to the fact this all inclusive price of $500.00 is less than seventy-five per cent of the steamship fare alone and the courtesy is extended at this rate to members of doctor's families if it is desired to have them along on the trip.

Any members of this tour desiring to remain in France after August 24th may do so at their own expense and can arrange for the same kind of first class return transportation on any of the ships of the French Line sailing at a later date, prepaid.

Application by letter should be made to Dr. Norman E. Titus, 57 West 57th Street, New York, Chairman of the Commitee on Arrangements for the Convention of the American Congress of Physical Therapy, who will handle the details of accommodations and make the necessary arrangements with a representative of the French Government's Tourist Office.

As a practical detail the amount of baggage should be confined to the least possible convenient limit. Dinner coats are essential for evening wear.

The number of members on this trip is limited to sixty.

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All changes of address must be sent to the Secretary, Treasurer, Director Bureau of Appointments and General Manager of the REVIEW. This will assure delivery of important notices and of the magazine. No second class mail is forwarded.

EDITORIALS

Eleventh Annual Convention, Milwaukee, Wis., June 27 to 30

ELECTION OF OFFICERS

The Executive Committee wishes to call the attention of the members of the association to the fact that nominations for the various offices may be made from the floor at the time of the convention. This point is being emphasized because several inquiries have come to the committee in regard to the single panel which was presented by the Nominating Committee. The present committee is unable to run again and it has seemed wise to present only one panel. Delegates should, therefore, be given instructions to vote according to the wishes of their respective chapters.

PROGRAM

Monday, June 27

4-6 P. M. Registration and Informal Tea.
8 P. M. Address of Welcome, Dr. Herman Schumm.
The Public Health Nurse and Physiotherapy, Miss Edna L. Foley.
Wisconsin's Program for Crippled Children, Mrs. G. Erle Ingram.
"Bridging the Gap," Film showing work at Spalding School.

Tuesday, June 28

8:30 A. M. Adult Clinic at Curative Work Shop—Miss Marjorie Taylor, Miss Mildred Elson.
10:30 A. M. Treatment of United Fracture of Neck of Femur, Dr. John Powers.
Follow up of Workshop Cases, Dr. Edward Quick.
12:30 P. M. Officers' Conference and Luncheon.
2 P. M. Business Session.
8 P. M. Scoliosis, Dr. Eben Carey.
Congenital Dislocation of the Hip, Dr. W. P. Blount.
Psychic Factors in Rehabilitation, Dr. H. Tabachnick.

Wednesday, June 29

10:30 A. M. Train leaves for Madison, Wis.
Message of Greeting, Dr. Helen Denniston.
Poliomyelitis Clinic, Dr. Robert Burns.
Visit Orthopaedic Hospital.

Thursday, June 30

9 A. M. Business Session.
1:30 P. M. Symposium—Abdominal Conditions, Miss Josephine Rathbone, Drs. J. B. Carnett, Q. Q. Deaver, Edmund Jacobson.
7 P. M. Dinner. Miss Lucy Blair presiding.
Speaker, Dr. F. J. Gaenslen: The Trilogy of Orthopaedics, Medicine and Physical Therapy.

Convention is approaching. I wonder if our members who have never attended a convention know just how much a convention means to our association—its growth and its progress.

Last year was the first convention that I, a comparatively new member, ever attended. Until then I had never felt the scope or the magnitude of our aims. I had not realized the pioneering behind us or still ahead of us.

I felt the great need for each and every member of our association becoming "association minded."

Within a chapter it is difficult to create "association minded" members. But that must be our aim. When each individual member realizes the great need of constructing a well-organized, efficient body with high standards worthy of splendid recognition, then and then only will our association become a valuable and recognized factor in the field of physical therapy.

Let's make all our members "association minded"!

M. E. H.

This year marks an important one in the business of the association and its convention. Speaking in the manner of an Irish bull it is important because it is unimportant. But stop—no business of the association is unimportant. No change of name threatens us, no rewriting and adopting of the constitution, no momentous factors in policy or education. But wait again—is that so? We all know in our everyday work the joy and impetus of starting a new job when no obstacle is too difficult to be overcome; we know the level of routine work and we also know the good, solid satisfaction of a good task done. At this time we can look back upon such a "job of work" done by our executive committee, and if you will reread our president's "Call to Convention" in the last issue of the REVIEW you will see that the business to come before it is the outcome of experience.

There are two items for which your serious consideration is requested. One is the amendment to Article VII: "To accept for special registration nonmembers who are trained in special phases of physical therapy. These applicants must submit credentials verifying their training and experience. An annual registration fee of $3.00 shall be charged." The added note explains the reason for such an amendment but it remains for us to decide the wisdom of it. We must decide whether we are in danger of lowering and commercializing our standards or whether we are supervising the activities of partial technicians and thus preserving our status. As we decide this we must remember that the association carries on its approved list courses not sufficient for membership, although there is apparently no connection between the two.

The second item is a recommendation that noncitizens of the United States not be accepted for membership until they have taken out their first citizen's papers. Again we are confronted with the wisdom of such a step and we must ask ourselves the question whether this has not a commercial flavor or whether we are defending our membership. Do our members need to be so defended? We are not one whit preserving jobs for them and we stand the chance of losing some very fine and valuable minds. Let us recollect that we are a professional and not a commercial organization and that our purpose is well and clearly set down in Article II of the Constitution.

We are meeting alone in Milwaukee and if we need a challenge let it be that. Let us come to our own meeting, our own time, our own program. Let us meet our own members, see our own work and KNOW OURSELVES. We will gather fresh material and a new outlook and we will know that we are—each and every one—important members of our association.

Massachusetts Broadcasting Station

Hello, fellow-members of the A. P. A! This is M. A. P. A. broadcasting from Massachusetts headquarters and giving the program of the year.

1931

October: Business Meeting and Report of 1931 Convention by delegates who attended convention.

November: "Latest Theories on Arthritis" by Dr. Loring B. Swaim.

December: "The Skin" by Dr. J. G. Downing.

1932

January: "The Health of Essential Nutrition" by Dr. F. L. Burnett.

February: "The Feet, and Shoes that Make or Mar Them" by Dr. Z. B. Adams.

February: "Anatomy and Physiology of the Nervous System" by Dr. E. W. Taylor. (Special Course of ten lectures.)

March: "Hydrotherapy" by Dr. Arthur Ring.

March: "Nervous Disorders" by Dr. E. W. Taylor. (Special course continued.)

April: "The Practice of Physiotherapy" by Dr. William McFee.

May: Dinner-Party, Election of officers, "Exhibition of exercises by the graduating class of 1882."

Let us hear about your activities, other chapters! This is M. M. M. signing off—cheerio!

Physiotherapy Technicians

Reprinted by permission from the Texas State Journal of Medicine, May 1932

"The problem of 'technicians' is one of considerable importance to the medical profession. On the one hand it seems an economic waste for a highly and expensively educated physician to devote a considerable portion of his time in a good many routine practices that are familiar to us all and that need not be discussed here in detail; and on the other hand, there is always the chance that if the physician does not himself attend to such matters, positive or negative harm may follow.

There is a third consideration of, we are convinced, equal importance with the others, and that is the tendency of groups of this character to blossom into full-grown and beautiful professional status. This tendency is admirably illustrated in the case of the so-called optometrist. Nobody objected in the beginning to the merchant, or the optician, selling glasses and attending to the routine fitting of glasses. The oculists, very largely, were too busy to bother with any except the more intricate cases of the sort. Now we find a profession intervening between the optician and the oculist. We have never been able to agree that there is either scientific or economic reason for this intervention, but that is another matter. The profession is here, and quite probably here to stay, and we must like it whether or not we want to (and for fear that we are misunderstood, let us say that, so far as we know, there is no fight on the optometrist).

The masseur has assumed to offer his services direct to the suffering public, under one guise or another. The druggist who, as a pharmacist, has so well served the medical profession and the public, has all too frequently assumed to tell the public what medicines it should take for its several ailments. And so on down the line.

Now comes the problem of physiotherapy, a comparatively recent development in medicine, although one of the most ancient curative methods. The progress of the several sciences used, and the art of their application to medicine, has brought about a development along this line that is rather astonishing to most of us when we begin to look into the matter. The multiplicity of machinery and methods of treatment call for a high state of knowledge and skill and the expenditure of a great deal of time. This method of treatment is due to be inordinately expensive unless the technician may be made use of to a maximum extent. For that reason those physicians who have sought to specialize in this branch, or have made it an important factor in their practice, have sought competent non-medical but technical help. Whether or not we shall agree to the intervention of a highly trained group just here, and take chances on the developments we have already referred to, is the problem. At first we were personally opposed to the idea, but further study has convinced us that those who are contending that such a thing should be done are advancing in the right direction. The idea now, it seems to us, is to determine just what can be done to prevent a development which will ultimately be hurtful to the public, such as the intervention, for instance, of a profession based on physical means of treatment, and requiring only a partial knowledge of medicine as the physician must know medicine.

In this connection, we quote from an address recently made by Dr. Clarence A. Patten of Philadelphia, Pennsylvania:

'Physiotherapists do not cure, they merely assist the individual to cure himself. The doctor's skill lies mainly in the application of his diagnostic skill and knowing precisely when to do something and when to let things alone. We will leave the word "healers" with its false interpretations to those who practice neck wringing, rib-cracking and body stretching, for science has carried us to a point where we believe and know that the laying on of hands or the playing of Yankee Doodle on the vertebral column will not dispel gall stones, cure intestinal obstruction or heal a fracture of the knee.—It is well known that in recent years a more wide-spread interest has been aroused in this part of the healing art and to such an extent that the American Medical Association has a committee appointed, whose duty it is to make a careful inquiry into physiotherapy. From the activities of this committee I hope and feel assured that medical colleges will devote more time to the teaching of this subject and physicians-in-the-making will graduate with more actual and practical knowledge than they have ever had before. They will have a greater familiarity with the whole subject and a clearer appreciation of its uses and limitations. It is because of negelect of the subject that so many illegitimate "paths" and "isms" have sprung up all over the world.

'When physiotherapy has reached the position it deserves in medical practice, physiotherapists will be expected to confine their activities to the carrying out of prescriptions written by physicians. This means that the maintenance of separate establishments with physiotherapists advertising for patients will have to cease and in their place will arise properly equipped and medically supervised departments of physiotherapy. It will no longer be possible, as it is now, for physiotherapists to receive a patient who comes without a prescription; examine him, diagnose some difficulty or other and proceed with treatment. Such an activity is, of course, the illegal practice of medicine and never has been or never will be a credit to physiotherapeutic art and skill. The American Physiotherapy Association will, I am sure, see to it that so valuable an adjunct to the science of medicine will not be degraded by unethical methods, which if not actual

quackery are very closely allied to it. The standards of preliminary education for those who enter this field of work must be raised and compensation increased to a figure that is commensurate with all types of skilled and technical professional endeavor with sound basic principles and a strong controlling national organization of physical therapy will soon attain proper recognition and hold the place in the relief of human ailment that its science deserves.'

We have investigated the American Physiotherapy Association mentioned above, and it is our opinion that this organization intends to develop its problem in the light of medical ethics. The requirements for membership in the organization are high, and yet sufficiently flexible to permit the correlation of the great variety of service of this character required by the practicing physician. The organic laws or the organization require that the 'standards of ethics of the American Physiotherapy Association shall be, as far as possible, those of the American Medical Association.' And, 'All members shall practice only under the prescription and direction of a licensed physician.' Physicians are eligible to membership, on a special basis. It is expected that those who are practicing physiotherapy as a specialty will take particular interest in the organization and will very largely direct its policy as to medical ethics. The organization is really small as yet. There are chapters in seventeen distinct sections of our country, one of which includes all of Texas. The advisory committee of the organization includes Drs. Elliott G. Brackett, Arthur T. Legg and Ernest M. Daland, all of Boston, Massachusetts. Miss Miriam Van Tassel, Medical Arts Building, Dallas, is secretary of the Texas Chapter of the organization.

We deal with this matter thus prominently, if briefly, because the subject discussed is itself an important one, and because of the fact that we have here a group which intends to help solve the problem and at the same time remain within due professional and scientific bounds. We think the medical profession has a selfish as well as an unselfish interest in the matter."

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Arthritis and a Uniform Nomenclature

By Mary McMillan, Boston, Mass.

Arthritis has been the subject of much study and research by the medical profession; this is especially true during the past twenty years. Authorities differ in their manner of classifying arthritis, but in general most agree that there are two main types. These two kinds of arthritis are often subdivided. The majority of British writers on this subject confine their terminology to the two terms, rheumatoid arthritis and osteoarthritis. The term rheumatoid arthritis includes the infectious joint conditions except the tubercular and the gonorrheal types, and osteoarthritis covers the joint conditions of traumatic origin. In the latter, infection is disregarded. These two terms do not convey anything from an etiological or pathological standpoint that especially applies to this particular disease.

American writers on this subject while generally of the opinion that there are two main distinguishable types of arthritis, use innumerable terms for similar joint conditions. An example of some of the most commonly known names used to designate arthritis of infectious origin are: atrophic arthritis, proliferative arthritis, chronic infectious arthritis, rheumatoid arthritis, etc.

In the next group of names that are used for the arthritis of traumatic origin are hypertrophic arthritis, degenerative arthritis, arthritis deformans, traumatic arthritis, osteoarthritis, etc.

The terms proliferative arthritis and degenerative arthritis are considered by some to more clearly express the pathological findings of the two classes. In the infectious type, proliferations are found along the margins of the affected joints, hence the term proliferative arthritis. In the tramatic type there is degeneration of the joint structures followed later by bony spurs and lipping of the marginal borders of the joints, thus the term degenerative arthritis in contra-distinction to the former type. Authorities differ regarding the matter of an infectious element in hypertrophic arthritis. Some feel that this is a noninfectious disease, while others claim that infection cannot be entirely eliminated even from the hypertrophic type.

Atrophic Arthritis

One of the most commonly used names for arthritis of infectious origin is atrophic arthritis. In atrophic arthritis there is the acute infectious type and the chronic infectious type. It is claimed by some that the light skeletal visceroptotic type of person who tires easily under nervous strain is more susceptible to arthritis of infectious origin, also that a constitutional predisposition and heredity to arthritis cannot be entirely overlooked. Lowered body resistance from physical or mental fatigue, exposure to excessive cold or dampness, emotional exhaustion, etc., make the body an ideal place for the fostering of infection. The infection presumably enters the joints through the medium of the blood stream.

The more recent bacteriological studies point definitely to a streptococcus infection. A great percentage of cultures taken from the blood and joint fluid of the atrophic arthritic person indicates a specific type of streptococcus. The teeth, tonsils, and the intestinal tract are suspected of harboring infection and may act as a foci of infection or the source of infection may be so insidious that even after a thorough investigation no trace may be found. Primary changes in the joint due to infection manifest themselves in the synovial membrane, the bone marrow, and later in the articular cartilage. In the acute infectious type, the onset is sometimes accompanied by pain and swelling of the soft tissues within the joint capsule. In the chronic infectious type the swelling usually comes on more gradually and microscopically the changes within the joint are those of a chronic infectious process.

In the majority of cases this disease occurs between the ages of twenty and forty. In very severe cases when found in young children it is sometimes spoken of as "Still's disease." Many years ago Still was the first to recognize and describe this condition.

In the chronic type of arthritis there is usually atrophy of soft tissues and X-ray pictures generally show a lack of density in the bone ends proximal and distal to the affected joints. Fibrous adhesions are apt to appear which later may develop into bony anklyosis and result in deformities. In some instances the inner coat of the blood vessels undergoes a change which implies a disturbance in the vaso-motor system.

Even after the primary focus of infection has cleared up there often remains a certain amount of residual infection in the system. By some this infection is considered to be the result of absorption that has taken place through the intestinal tract resulting in a systemic toxemia that keeps up an active condition of irritation in various joints for an indefinite period.

Treatment

A thorough search should be made for the foci of infection. Laboratory tests, X-ray pictures of the affected joints, and a thorough physical examination may determine the source of infection, in which case this source of infection is removed if possible, otherwise it is treated according to the nature of the trouble. Treatment may consist of any one of the measures stated below, or they may be used in combination. Rest, heat, diathermy sun baths, if possible, sweat baths or local sweat packs, diet, posture training, deep breathing exer-

LATERAL VIEW OF KNEE-JOINT WITH MARKED ATROPHIC ARTHRITIS, SHOWING COMPLETE DISAPPEARANCE OF THE JOINT LINE, DIMINISHED DENSITY OF BONE AND ANKYLOSIS.

EXTENSIVE HYPERTROPHIC ARTHRITIS SHOWING MARKED DEGENERATIONS WITH A THINNING OF CARTILAGE AND INVOLVEMENT OF THE ARTICULAR SURFACES OF THE KNEE-JOINT. NOTE THE OSTEO-ARTHRITIS OUTGROWTHS ON THE PATELLA AND ON THE FEMUR.

cises, bicarbonate-and-saline high colonic irrigations and general body building by means of massage and exercises, vaccine treatment and the use of plaster casts.

Should vaccines be used the period of treatment may vary from three to thirty months. The interval between injections is regulated according to the reactions in the joints. At the present time the introduction of subcutaneous or intravenous vaccines play an important role in the treatment.

Regular tests are made to guard against overacidity. The diet is carefully prescribed. A general rule to follow consists of 20% of meat and carbohydrates and 80% of fruits and vegetables. Local treatment consists of hot packs, sweat packs, diathermy or heat applied to the affected part by means of the infra-red-lamp. This usually precedes kneading and effleurage of the soft tissues above and below the affected joint. The joint itself is carefully avoided for fear of stirring up inflammation. The *gentlest* stroking only may be given over the joint "fairly stroking." The latter is given for its reflex effect. This very gentle stroking is good for reducing pain and spasm in the surrounding muscles.

General massage, posture training accompanied by deep breathing exercises is helpful for body building.

A series of high colonic irrigations comprising six to twelve treatments during a period of three to six weeks is sometimes used in combination with other forms of treatment, if there appears to be some intestinal stasis.

In severe cases a stationary or removable cast is sometimes worn for short or longer periods according to the severity of the condition. This cast assures rest for the part affected and prevents deformities.

HYPERTROPHIC ARTHRITIS

The outstanding pathologic finding in hypertrophic arthritis is degeneration of the joint cartilage which in the advanced stage may become very thin or even entirely disappear. The bone ends then become very hard and ivory-like. This is spoken of as eburnation. X-ray pictures show cartilaginous or bony spurs along the marginal borders of the joints. In the knee joint, spurs are more easily seen and are commonly found along the margins of the patella and the spine tibia. These bony spurs may break away from the joint margins, especially from the articular surfaces and remain free within the joint. At times the loose bodies or "joint-mice" as they are sometimes called, lodge in a place which interferes with motion. There are times when these bodies become a mechanical obstruction to joint movement, in which case the condition may indicate surgical care.

Small nodes seen on the phalangeal joints come into this class of arthritis. These are known as Heberden's nodes, and are disfiguring but if not over-exercised or exposed to injuries may give little or no discomfort.

The early symptoms of hypertrophic arthritis are recognizable by the presence of swelling and of thickened tissues around the affected joints. Later, cartilaginous and bony spurs appear along the margins of the cartilage. Crepitus is frequently present and is heard when the knee is bent in walking, especially so in coming down steps.

The onset is insidious and oftentimes painless. Hypertrophic arthritis is found more commonly in persons over forty years of age. It is considered a disease of middle or later life. It is not infrequently found in the low back, knees, large joint of the great toe, and in the terminal phalanges, but is seldom found in the ankle-joints. People of the heavy type are more apt to show symptoms of the hypertropic type. Those who are on their feet a great deal, especially those who have marked faulty posture, are apt to develop arthritis of the knee-joints, because the body mechanics are disturbed and the body weight is improperly distributed on the bearing-surfaces of the knee-joint. If the arthritis attacks the back, it often starts in the last dorsal and first lumbar vertebrae. Small spurs of bone appear from the sides of the bodies of the adjacent vertebrae. Later the spurs bridge over, the lower edges dove-tailing into the upper, so that a firm locking of the joints ensues. The pain and discomfort then usually become less pronounced.

In the knee-joint the hamstring muscles have a tendency to contract. This causes limitation of motion in walking. To rectify this condition the patient may be instructed to push down on the heel from the lying

position. At the same time the operator may assist the stretching of the hamstrings by grasping the leg directly beneath the knee-joint with the left hand, and directly above with the right hand, and simultaneously with the patient's effort, exerting a steady pull on the posterior thigh muscles.

Both atrophic and hypertrophic types of arthritis may be found at the same time in one individual. For example a deformity of the foot of the atrophic type may change the mechanics of the whole leg so that improper alignment may be found in the knee joint resulting in every appearance and symtom of the hypertrophic arthritis.

The treatment for hypertrophic arthritis is similar to that prescribed above for atrophic arthritis. The same physiotherapy modalities are used in various combinations to suit the particular case.

Modern medical science today is directed towards further alleviation or eradication of this baneful and all-too-prevalent disease. It is to be hoped that it succeeds and that some satisfactory terminology may be arrived at so that doctors, research workers and students of arthritis, when dealing with the same condition may be able to speak the same language.

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The Educational Problems of the Physical Therapy Technician

By Signe E. Hagelthorn, Associate Professor of Education, New York University

When perplexing questions in regard to the physiotherapy law seem to overwhelm us, we must remember that we are pioneers. Our struggle should be such that in the end others may succeed. We are, after all, intent upon one thing, and that is immediate relief for the suffering and the care of sick people. All attention must be focussed on that problem, and other things become details. To train the members of this profession to do the work to the satisfaction of the physician, to aid in the relief of the suffering, especially the chronic cases, and to develop sufficient skill to take an intelligent part in the therapeutic work of the physician, we must turn our attention at once to such training. Whether that training is to be had in order to secure a state license, or not, is not the immediate interest of the institution that sponsors this curriculum.

Some years ago in the School of Education of New York University, the problem of training physiotherapists was presented, and we were asked to help to solve the problem, as for two years subsequent to the passing of the State law, no institution had been offering courses to meet these standards. I happened to be connected with teacher training in health and physical education at New York University at this time, and so by mere accident, I fell heir to the problem of helping to organize a four year physiotherapy curriculum.

Why four years for the training of the physiotherapy technician—the four years required by the law? We have been accustomed to the employment of trained nurses in this field, supplementing their training by short courses in physiotherapy offered in a few specialized institutions. Most of our hospital training schools for nurses require for entrance, high school graduation. The nurses' training course is three years, and often on top of this, a special training course of one year or less for specialization, making in all, four years of professional training in addition to graduation from high school or its equivalent. The tendency throughout the United States is to require a fundamental common schooling, of high school graduation or its equivalent. There is a tendency in some of our States to impose upon these four years of high school two years of junior college or at least to offer such opportunity, especially to the students seeking pre-professional training. If you examine the curricula of any college offering, you will notice that there are certain fundamental or academic subjects required, such as English Composition, Survey of English Literature, Oral English or Speech, Personal and sometimes Public Hygiene, and then one or two courses in science, also, one or two courses in Social Sciences, such as Government, Economics, or American History. Such a program is considered a general and cultural foundation for collegiate training, especially in some professional fields. Today we feel that no one is qualified to choose a life work on a professional basis unless that individual has been introduced to one or more of the natural sciences.

Why should a physiotherapist be required to take two years of this pre-professional training? Should we take high school graduates without any such training at the age of seventeen or eighteen, plunge them directly into professional training where they work with patients, and two years later allow them to carry more or less responsibility for the doctor, and for the patient? I think you will find that these seventeen-year-old immature individuals, no matter how bright, without exception, are really not wanted in the hospitals. As a rule, patients (even if they are free patients) have very little confidence in the eighteen or nineteen-year-old technician. We find that it is generally quite distasteful to the patient to be turned over to such "almost childlike" individuals, even if they are "professionally trained," so it is far better if they can all have the opportunity of a two year pre-professional course.

Some physicians claim that one year of actual theory and practice is sufficient, but what about all the preliminary sciences, the sciences pre-requisite to physical therapy? What about biology, anatomy, and applied anatomy, chemistry, physiology and applied physiology, the theory and practice of corrective gymnastics, etc.? There is a definite sequence to these courses, and arranged on regular college basis, *one* year of biology is pre-requisite to *the year* of anatomy, both of these are pre-requisite to applied anatomy, and based on these, the subject of corrective gymnastics. It is readily seen that the third year is taken up with the study of applied sciences based on the fundamental sciences of the first two years. By the fourth year, we feel that the student can enter into the theory and practice of physical therapy without having the patient resent his youth and immaturity, and without having the doctor feel that the student cannot be trusted without constant "check up" and supervision.

What should be included in this fourth year? First, we want the student to have the opportunity to gain as much light and information as is available now in this therapeutic field, and a thorough knowledge of the modalities to be used, a knowledge of the effect of them, a knowledge of the literature that is being added to the field, and the ability to understand and interpret the constantly changing contributions to this theory. It is not a static field. It is undergoing rapid changes due

to new discoveries. What about the student who graduated two, three or five years ago? Unless that student developed the ability to interpret scientific literature, he is at a loss to keep abreast with the developments. We must give our students in these four years, an insight into the future developments in the field, as well as the modalities, how to use them and their effect. In the fourth year, the students also have the opportunity for clinical practice to develop sufficient skill in the use of modalities to satisfy the requirements and the standards of the medical profession. Naturally this experience in practice should be as varied as possible. Hospital and clinical service is necessary in order to gain this experience. The department of physical therapy at our hospital with varied type of clinical material, offers such opportunities and this experience is extended by a number of hospitals cooperating with our training school. *To summarize the training,* we find that the *four* years are made up of *two* years of college training of general culture with as much science as it is possible to introduce; the third year is preparing students in the applied sciences pre-requisite to physical therapy, the fourth year definitely prepares the student in the theory and practice of physical therapy. This training admits the student to the New York State licensing examination, but it does not assure him of a license. *It prepares the student for admission to the examination.*

When a student spends four years in training on college level, naturally such a student desires the insignia for the completion of a four year college course—the baccalaureate degree. It follows naturally that the student wants to be ready for both the B. S. degree and the license. The B. S. is *not required* for the license, but if one is going to spend four years to comply with the State requirements, why not secure a B. S. at the same time? It has also been made possible to offer the graduate student an opportunity to present a certain number of credits from our physiotherapy course as partial fulfillment of the Masters degree in the School of Education, New York University. We find that there is almost no opportunity to become a member of the faculty in a normal school or state teachers college in the United States without the M. A. degree. If a physiotherapist is interested in teaching in a teacher training institution, where opportunity is given for specialization in the corrective field, for the training of teachers of crippled children, and etc., such a person may not be appointed to the faculty without the Masters degree, consequently the aspirant to such a position is more or less forced to acquire the graduate degree. The profession itself should hold up its own standards, and no one from the outside should be needed to create their standards. The law created the standards of *four years,* but not the content of the curriculum. The question came from within. What are we going to do with these four years to get the most out of them? How shall this professional group be trained *not to compete* with the medical profession, but as a *competent aid* in the problems of the doctor?

DISCUSSION

What about the financial investment of the four years' course? Is it commensurate with the income? If we consider this, we might ask the same about any of the other professions—that of the doctor, of the dentist, of the nurse, etc. Standards must be set up in any new profession. Two years of professional training are a part of this "four year" curriculum, and we should feel that the physiotherapist may receive a salary commensurate with two years of training. The trained nurse is required to spend *three* years in professional training.

The School of Physical Therapy at the Hospital for the Ruptured and the Crippled has been in existence for a few years. It began by offering an opportunity to any *trained* person, a trained nurse, or a teacher of physical education, to specialize in physiotherapy. It has now extended its work to the training of students for the licensing examination required by New York State. College connections are being established with several colleges. This will make it possible for the students to have a choice. It will also be possible for the students, who come from other colleges or normal schools, to submit their transcripts for advanced standing in the college, which requires the most units *already held by them* so that they will lose the least possible credits in transfer. Up to the present time, New York University has been the only one to accredit the physical therapy course at the Hospital for the Ruptured and the Crippled with a value of 32 points, that is one year's work. We expect that the school will be accredited by several colleges. The catalogue announces that students who wish to have a definite understanding in regard to this plan, shall present their transcripts to the Dean of the School of Physical Therapy, expressing his preference of the college connection.

The Value of Physical Therapy as an Adjunct to Medicine and Surgery

By W. C. Freeman, Associate Professor, Physical Education, Director; Department Physical Therapy

As read before the Ohio Student Health Convention, Cleveland, Ohio, Apr. 8, 1932

Physical Therapy is not a new subject but up to the time of the World War it was little known and practiced by the medical profession, at least very little attention was given to the field of Physical Therapy. The late Dr. Frank B. Granger, at the Boston City Hospital was one of the few medical men who had already established a department of the valuable adjunct to the field of modern medicine previous to that time. The cause so worthy and so fertile in its beginning, has grown and multiplied until today it exists in almost every city or community and has become a field for extensive study and research of medical men, nurses and physical therapy technicians. Just last year the Northwestern University Medical School introduced two new courses, one a post-graduate course in physical therapy for the medical profession and a course of one year for technicians that is, this course is designed for graduates of Physical Education and Graduate Nurses. The course is also approved by the American Physiotherapy Association and meets the curriculum recommended by the Council on Physical Therapy of the American Medical Association.

It is necessary first to comprehend the meaning of this subject, Physical Therapy. By it is meant, the mode of treatment whose procedure is governed by physical agencies; that is, the using of physical agencies to produce physiological effects.

In the history of cure then, science and experience have added Physical Therapeutics to the armamentarium of the Medical Profession which today is comprised of a triad of Medicine, Surgery, and Physical Therapy, although it occupies a separate field of its own, it very rarely works to the exclusion of Surgery or Medicine.

The needs and uses of Physical Therapy as applied in the medical profession may be summed up by a statement of Dr. McFee who says, "The constantly growing importance of Physical measures as agents of treatment is everywhere becoming more apparent. In a general way the use of Physiotherapy is indicated whenever we wish to modify profoundly the process of nutrition, remove effete material from the organism, stimulate assimilation, and thus invigorate digestion, soothe nervous irritability, relieve nerve pains, increase nerve force, remove diseased deposits from inflamed joints and their surrounding areas by absorption and thus restore their normal usefulness, and to stimulate and equalize circulation; also to prevent infection by means of sterilization, and to combat and overcome infection when it has developed." Surely a role like this becomes not only an adjunct to those which have gone before but involves the importance of a fundamental supplement.

Taking an instance of the surgical conditions first, we will attempt to show of what importance Physical Therapeutics really can be. In the injuries of bones and joints and the diseases culminating from them, Physical Therapy gains results where surgery ceases to be of further aid. With delayed union, diathermy often proves sedative and efficient. Likewise in cases of dislocations, sprains, fibrous ankylosis, weak feet, periostitis, infections and traumatic arthritis, low back conditions, it is useful. Beside this, local and general ultra-violet, radiant light and heat, such as the deep therapy lamps and infra-red burners, paraffin bath, and hot whirlpool baths, galvanism, and massage have been very effective. Diseases or injuries of the muscles such as strain, myositis, torn muscle insertions or cases of muscular atrophy require diathermy and the sinusoidal current.

Diseases of the skin such as, alopecia, furuncles, erysipelas, Herpes Zoster, eczema and tineas have been helped by the use of the ultra-violet, diathermy and paraffin bath. Indolent ulcers can be remedied by the use of diathermy or the application of ultra-violet.

Turning now to the medical conditions which require Physical Therapy, we find injuries to the central and peripheral nervous system under which come Hemiplegia, infantile paralysis, Neurasthenia, Neuritis and injuries to the peripheral nerves. Many forms of Physical Therapy can be used to advantage for these, such as hydrotherapy, diathermy, radiant light and heat, ultra-violet, galvanism, sine wave currents and medical or remedial gymnastics.

Of the respiratory system, coryza, tonsilitis, laryngitis and bronchitis, can be effectively treated by local ultra-violet, radiant light and heat, and diathermy. There has been a great deal of research work done in Pneumonia by Dr. Harry Eaton Stewart of New Haven, Conn., who has been credited as an outstanding Physical Therapist and contributed a great deal of time and energy to this type of cases. He has nothing but praise for Diathermy in Pneumonia treatment. Through his untiring efforts, his colleagues have

dubbed him the "Father of Pneumoniatherapy." Dr. Titus states, "I believe one of the first results of the use of diathermy in Pneumonia is the relief of vascular spasm." Quoting Stewart again, "The point is that the heat from diathermy is central. This is the first time in the history of medicine that we have been able to develop a controlled central heat where we will." Dr. Granger made this statement, "We have found at the Floating Hospital that the use of diathermy has been distinctly advantageous in various types of Pneumonia." "Recent experiments carried on by the Rockefeller Institute proved that despite the heat-dissipating powers of the blood, the deeper seated tissues were heated to an appreciable degree, and that should anything interfere with the circulation there was a sharp rise of temperature in these structures which, if continued long enough, might produce an electro-coagulation. These same experiments showed that in a normal lung diathermy produced only a slight rise in temperature, but should any occlusion of the pulmonary circulation take place, there was an immediate and decisive rise in temperature." This is suggestive, as in certain types of Pneumonia there is marked interference with the pulmonary circulation.

To go now more fully into the various phases which comprise the treatments mentioned in this paper. These are Massage, Electrotherapy, Thermotherapy, Hydrotherapy, Medical Gymnastics, and Heliotherapy or more commonly known as ultra-violet.

Massage included effleurage or stroking which is sedative in effect and brings about lymphatic and venous circulation, petrissage or kneading and lifting of the muscles which inspires muscle tone and assists in the venous circulation, friction which is deep, rapid rubbing which promotes return-circulation, relieving deep seated congestion, tapotement or percussion, the rapid hacking or slapping of the hands or finger tips to give tone to the nerves, muscles, and skin. In many instances massage plays an important role in the completion of a treatment. Again quoting the late Dr. Granger who made this statement, "This combination use of massage is something which is sadly lacking." "There is much good massage in the United States but it is unfortunately concentrated in the larger centers, and hence the average for the country as a whole is low."

"If the medical profession at large, in their use of Electrotherapy, will, as they expand, insist on having office assistants, trained in massage and muscle re-education, the standard of treatment will be raised in short order."

Electrotherapy is probably the most used and effectual of the various forms of treatment. It is here we find Galvanic, Faradic, Sine Wave and High Frequency currents.

The Galvanic current is a direct current and is used for its polarity or chemical effects. The Faradic or induced current can be classed as a primary or secondary. This former is merely a weak interrupted galvanic current which accomplishes little and is rarely employed. The secondary Faradic is an alternating, assymmetrical, induced current with high voltage and low milliamperage. Seemingly this current has no ionic properties either medical or surgical but brings about effects which are mechanical, a bit thermic, and considerably psychical. During the World War, a much smoother current with less sensory effects was developed which is known as the Bristow Faradic Coil. This is used to relieve stasis, exercise atrophied muscles and strengthen them, promote circulation and elimination and alleviate pain. This current is used when testing for reaction degeneration.

The Sine Wave currents are used chiefly in the treatment of muscles. The waves produced bring about contractions in the muscles. With this current the effects are tonic and trophic. In summary it can be said that the Sine Wave currents promote metabolism, assists elimination and circulation, and relieves stasis.

When we speak of High Frequency, we automatically include three currents, the D'Arsonval, the Tesla, and the Oudin. The D'Arsonval type of High Frequency is the current used when treating with diathermy. It is of a fairly high voltage and milliamperage and it seems to cause a local, active deep-seated hyperemia, thus promoting: 1. Tissue drainage. 2. An influx of arterial blood with its nutritional value. 3. An increase in the leukocytes of which the phagocytes may play some part. This type is called Medical Diathermy. The other two forms are sometimes called Surgical Diathermy but in reality it is electro-surgery. They are used for fulguration or dessication and the vacuum or non-vacuum tube in treatment.

Thermo-therapy includes the use of High Frequency, the electric light cabinet, light applications, and infra-red rays. Light in this instance is converted into heat by the resistance of the tissues in the body under the light. Heat is classified as conductive and it is produced when applying directly on the surface, in other words, in contact with the surface, as convective or radiation when thrown on the surface from gas burners, electrically heated coils or from the source of the large incandescent lamps, conversive, when generated within the tissues themselves as in the application of diathermy.

Electricity, in summary, may be said to cause certain physiological effects which are chemical as polar effects, thermal particularly in high frequency currents, mechanical as there are muscular contractions.

Hydrotherapy is the division most easily and frequently used by the majority, whether in the clinic or at home. The mere drinking of water to preserve life is one form. Using water as a solvent for cleansing is another. Stimulating treatments consist of application of cold or alternating pack to reduce fever, the cold plunge or cold douche, spray, cold or alternating foot baths or hot sitz baths for pelvic conditions. For sedative effects and relaxation warm or hot packs, the needle spray or hot foot-tub-baths are employed. Elimination by Hydrotherapy is obtained by the Scotch Douche, the warm pack, increased water drinking, mud or whirlpool bath, and enemas in cases of fecal solidification or stasis.

The use of ultra-violet radiation in the treatment of numerous pathological cases is becoming more popular than ever before. The main sources of ultra-violet are: natural, which is the sun; and artificial, which now include the different types of lamps such as the carbon arc, the mercury vapor arc and now, the so called "COLD QUARTZ." Granger made a very pertinent statement and one filled with a great deal of wisdom, he said that it is through the medium of the press and popular magazines that both professional and lay opinion have been led to consider the sunshine and happiness as synonymous. He further states, "If natural sunshine is lacking the artificial will more than replace it." This point of view is pregnant with possibilities for good and for evil. No one desires to deprive the public of the benefits of ultra-violet irradiation, yet if such treatment is instituted without adequate medical supervision, not only may disastrous

results ensue, but also from the most inevitable tendency to self diagnosis and self treatment irreparable harm may be brought about in pathology in which correct and early diagnosis and proper treatment would probably have resulted in cure.

It is very important to have a thorough understanding of the properties and the physics before using ultra-violet, but it is beyond the scope of this paper to delve into the scientific phase of it as time will not allow. Permit me to make this warning,—do not collect your information from the salesmen as their only concern is in selling you the equipment and that kind of knowledge has hurt Physical Therapy more than any other one thing in the past. Gather it from the proper sources and then do not be afraid to use it.

Allow me to mention just a few principles that are involved in its application. Regarding the dosage you should take into consideration the sex, age, texture and color of the skin and the type are very important factors in ultra-violet dosage. As a general rule blondes are more sensitive than brunettes, young people respond more quickly than old, likewise females more than males. In judging the endocrine type of an individual it is well to note the color of the eyes, rather than the color of the hair. Blue eyes are blondes, brown or black eyes for brunettes. The skin also represents a good indication for dosage.

Before general exposure to radiation is commenced it is often advantageous to test the patient's sensitivity to the ultra-violet rays.

When a skin surface is subjected to ultra-violet energy, two phenomena are observed: Hyperemia and Erythema. Ultra-violet is used for two effects; the systemic, which is produced from general body radiation and bactericidal, produced by a local application.

At Ohio Wesleyan we use ultra-violet for general run down conditions, aenemics, during convalescence and as a means in building up the individual's resistance. We also use it as a bactericidal in the treatment of skin lesions such as tineas, infections and all acute nose and throat conditions. We are equipped with two carbon arcs, two mercury vapor arc lamps. For the past six weeks we have had the use of a Cold Quartz body applicator and the orificial type. I wish to make this statement regarding the orificial lamp: We have treated a great number of cases with this type of applicator and have found it to come up to our expectations and more. In the number of conditions treated there were about forty or fifty nose and throat cases and every one of them responded, such conditions as Coryza, Laryngitis, Tonsilitis, this last named case cleared up on one application, the others from one to three treatments. One case of Vincent's Angina cleared up in six applications. Just a word in regards to how the Orificial applicator is used, the parts to be treated are swabbed or painted with a 1/500 solution of Sodium Eosin which is used for its flourescent properties and, if applying to the nose, the applicator is lubricated with a clear mineral oil to allow easy penetration and the ultra-violet is exposed to the parts under treatment from 20 seconds to three minutes. It is not necessary to use the oil when applying it to the throat. The applicator is placed right in contact to the parts being treated. Just note what such men as Dr. Bachem of Chicago University and Dr. Disraeli Kobak, Chicago, Ill., have to say regarding this new way of applying ultra-violet. Dr. Bachem states, "I made some measurements on the cold quartz ultra-violet lamp. The main advantage for the problem seems to be the mono-chromatic qualities of this type of lamp, which probably emits the richest wave length at 2587A°. With a light of such intensity it can be easily regulated or suppressed by filters. This surely is a great advantage. Whether this particular wave length is of value for certain indications still remains to be seen. I must say that it seems to have a great bactericidal and irritative effect." Dr. Kobak states, "I became interested in the lamp from the Therapeutic point of view, and took advantage of studying its effects on clinical patients. I found that the shorter distances, 20 to 5 inches, produced a more prompt skin reaction than the longer ones used with my other lamps. The general effects were the same but I was able to use this lamp at some rather impossible angles." Its clinical and biophysical nature should be scientifically explored by competent investigation. Such work may demonstrate the limitations or superiority of this type of ultra-violet radiation." Dr. Oscar Nugent, Chicago, has a very interesting article on the Cold Quartz Orifical Irradiation in the February issue of the Archives of the Physical Therapy, official journal of the American Congress of Physical Therapy.

At Ohio Wesleyan University we are fortunate in having what is probably the best equipped Physical Therapy Department for Undergraduate schools in the state. This department is one of the many interdepartments which make up the Department of Hygiene and Physical Education, here treatment is available to all students of the University and members of the faculty and their families. They come in for treatment either of their own initiative or are referred by the Student Health Department, headed by Dr. Lowry. From thirty-five to forty patients a day are treated; the total list of treatments last year numbers 7958. This work is done by Dr. Roberts, Head of the Department of Hygiene and Physical Education, and myself in addition to our regular teaching load.

Here the sick and injured obtain treatment and are restored to usefulness through the use of heat, water, radiant energy, electricity, massage and medical gymnastics.

A large part of our success lies in the fact that we attempt to give consideration to two aspects; the scientific and the human, in the former the intelligent use of physical agents in the treatment of the sick and injured, and in the latter, the continued interest in the patient through convalescence to final recovery and complete restoration.

The types of cases cover a wide range, including sprains, strains, dislocation, fractures, coryzas, bronchitis, neuritis, arthritis, osteo-arthritis, and the after treatment of Poliomyelitis. Coach Gauthier especially commends our department for our work in caring for the athletic injuries and in speeding the recovery of valuable players.

In addition to the treatment given, a regular course in Physical Therapy is offered to both men and women majoring in physical education. The knowledge gained is considered invaluable to students continuing medical work and those becoming doctor's assistants.

In concluding I wish to reiterate in brief the practical uses of Physical Therapeutics as a supplement to Medicine and Surgery.

I have stated that various pathological conditions which are alleviated by the use of Physical Therapeutics. These diseases include Pneumonia, Arthritis, Neuritis, Bronchitis, Indolent ulcers, Coryza, and Tineas as the most frequent.

To the coaching staff of Ohio Wesleyan our department is indispensable in promoting the recovery of players with muscle injuries.

The common "cold" with its simple complications is speedily taken care of with diathermy, the deep therapy lamp, and ultra violet.

The aid in the correction of intestinal abnormalities by the use of massage, Sinusoidal current, and douches has been explained.

The benefits derived from various forms of artificial sunlight has been explained in case of aenemic and run down conditions.

Thus we see that as an adjunct to Medicine and Surgery, Physical Therapeutics is becoming one of the most valuable branches of the sciences which improve the physiological functioning of the human body.

1931—1932

AMERICAN PHYSIOTHERAPY ASSOCIATION

The following is a list of schools and courses in Physical Therapy which have shown cooperation with the Committee on Education by submitting their present curricula for consideration and stating their willingness to adjust their courses of training to meet the requirements of the American Physiotherapy Association.

COURSES IN PHYSICAL THERAPY

Graduates of the courses listed below are accepted for membership only if prerequisite training meets the standards of the Association.

Beth Israel Hospital, Newark, New Jersey
Dr. Jerome Samuels (Temporarily discontinued September, 1931)

Children's Hospital, Sunset Boulevard, Los Angeles, Calif.

Harvard Medical School, Course No. 445,
240 Longwood Avenue, Boston, Mass.

New Haven School of Physical Therapy,
303 Whitney Avenue, New Haven, Conn.
Dr. Harry Eaton Stewart

Northwestern Medical School
303 East Chicago Avenue, Chicago, Ill.

Southern California School of Physiotherapy
San Gabriel, Calif.
Dr. William W. Worster

Tacoma General Hospital, Tacoma, Wash.
Miss Ruth Babb
(Temporarily discontinued September, 1931)

University of Iowa, Iowa City, Iowa
Dr. Arthur Steindler
(Temporarily discontinued September, 1931)

University of Michigan, Ann Arbor, Mich.
Miss Mabel E. Holton

University of Pennsylvania,
School of Physiotherapy of the Graduate School of Medicine
Philadelphia, Pa.
Miss Eleanor Lynn

Walter Reed Hospital, Washington, D. C.

William and Mary College (Extension Division)
827 W. Franklin Street, Richmond, Va.
Dr. Thomas Wheeldon

SCHOOLS OFFERING UNDER-GRADUATE COURSES IN PHYSICAL EDUCATION WITH A PHYSICAL THERAPY MAJOR

Bouvé-Boston School of Physical Education
105 South Huntington Avenue, Boston, Mass.
Miss Marjorie Bouvé

The Hospital for the Ruptured and Crippled
(Third year out of residence, New York University)
321 East 42nd Street, New York, N. Y.
Dr. K. G. Hansson

Sargent School of Physical Education
(Boston University School of Education)
6 Everett St., Cambridge, Mass.
Mr. Ernst Hermann

Posse Nissen School of Physical Education
779 Beacon Street., Boston, Mass.
Mrs. Constance Shields

University of Wisconsin, Madison, Wis.
Dr. H. D. Denniston

SPECIAL COURSE. NOT SUFFICIENT FOR MEMBERSHIP. SIX WEEKS.

Harvard Medical School
Courses for Graduates, No. 441
240 Longwood Avenue, Boston, Mass.

Abstracts

By John S. Coulter, M.D.

Mending Crippled Minds with Modern Therapeutic Aids. By Max A. Bahr, M. D., Superintendent, Central State Hospital, Indianapolis, in Mod. Hosp., XXXVII:6:52, Dec., 1931.

The treatment of patients by recreational and diversional occupation is an essential feature in every modern state hospital for mental diseases. It is now generally agreed that occupational therapy together with recreation and amusement constitutes one of the best available methods of treating mental patients.

If a patient can be interested in something outside of himself and be made happy it will aid his recovery. Arousing the patient's interest, therefore, is of the greatest importance and may be considered the primary object to be attained in cases in which occupation is prescribed.

In this form of treatment it becomes absolutely necessary to enlist the cooperation of the patient before occupation is prescribed and to explain to him why it is advisable for him to carry on some form of activity. This suggestion must be made tactfully, for, especially in cases with delusions, antagonistic attitudes are frequently encountered.

In the administration of such a program of treatment many considerations must be constantly borne in mind. The treatment must be prescribed and administered under the advice of the medical officer and treatment in each case must be individualized and graded according to the patient's strength and capacity and the interest he displays. The chief occupational therapist should be well trained in arts and crafts and skilled in dealing with mental cases. He should have enthusiasm, vision, initiative, tact and a background of successful experience.

Diathermy and Surgical Shock; in the Brit. J. of Phys. Med., VI:9:181, December 1931.

All these conclusions were recently very fully discussed by Prof. H. Eppinger of Cologne (1). The ideal anaesthetic (he states) is nitrous oxide because it leaves the circulation undisturbed; and the remedy he thinks best for raising the vascular tone is strychnine. He also recommends inhalation of CO^2 to stimulate the respiration, and so combat the acapnia, preventing atelectasis and pneumonia. One of the chief symptoms of shock is loss of temperature; to prevent this he recommends wrapping the patient in warm cloths and the application of radiant heat, diathermy, and massage.

(1) EPPINGER, H. (1931): Wien, Klin, Wochenschr., No. 3, 1931.

Regulation to Govern Advertising of Ultraviolet Generators to the Medical Profession Only. Council on Physical Therapy—in Jour. A. M. A., 98:5:400, Jan. 30, 1932.

Therapeutic claims in advertising matter and descriptive literature to the profession in professional publications are limited to conform to the following statements based on the best available evidence:

The evidence available, January, 1932, indicates that ultraviolet rays have a prophylactic and curative effect on rickets, infantile tetany or spasmophilia, and osteomalacia.

Prenatal irradiation of the mother, and also irradiation of the nursing mother, appear to have a definite preventive influence on rickets. This, however, requires general irradiation of the nude body; mere exposure of the head and face could not be expected to yield such a result.

Irradiation may also exert a beneficial action on other disorders of calcium metabolism, but the limits of such action, the conditions under which it may be produced, and the specific influence of the rays have not yet been fully explored and specified.

Exposure of the lesions of erysipelas and a wide area of surrounding tissue has been shown to have a favorable effect on such lesions.

The benefit derived by patients suffering from tuberculosis of the bones, articulations, peritoneum, intestine, larynx and lymph nodes when exposed to natural sunlight or to the rays emitted by certain artificial sources of radiation cannot be doubted, but the precise role of ultraviolet rays in such action has not been clearly determined. It is probable that visible radiation and the conditions of the atmosphere share in such action.

As far as normal persons are concerned, the claim that exposure to ultraviolet rays increases or improves the tone of the tissues or of the body as a whole, stimulates metabolism or tends to prevent colds has not been conclusively substantiated.

Among the diseases of the skin, on lupus vulgaris alone can ultraviolet rays be said to act specifically, and this only when the disease is treated strictly on the Finsen principle. In other dermatoses (scrofuloderma, erythema induratum, psoriasis, pustular folliculitis, indolent ulcers, furunculosis, acne vulgaris, angioma serpiginosum, parapsoriasis, pityriasis rosea) local or general exposure to ultraviolet radiation may have a favorable action, but the improvement that may result cannot be regarded as a specific effect of the rays. In some cutaneous disorders (eczema, psoriasis, lupus erythematosus, herpes simplex, erythema solare perstans, xeroderma pigmentosum, freckles, atrophy, keratoses, prematurely senile skin) exposure to such rays may cause an exacerbation, provoke an attack, or produce other injurious effects.

Evidence of new uses of ultraviolet rays may be brought to the attention of the profession, provided such evidence is acceptable to the Council.

Sunburn Tanning. Herman Goodman, M.D., of New York, in Arch. Dermat. & Syph., 25:1:15, January, 1932.

COMMENT ON THE ACTION OF LIGHT ON THE SKIN

Summary

I have reviewed the factors of pigmentation of the normal skin and discussed the features of induction of pigmentation of the white man's skin by radiation from solar and artificial sources. The subject of sensitizing the skin to make it more amenable to the production of pigment through erythema-producing radiation is touched on, particularly as it affects cosmetic tanning, photogenic diseases and eruptions of the skin partially responding to solar radiation.

This entire subject of the biology of pigment in relation to vital ultraviolet radiation is important in view of the wide use of emanators of this type of radiation and the equally wide use of medicines of the coal tar derivative group, since it appears that coal tar quotients by ingestion in some persons induce a sensitivity to ultraviolet radiation.

Local responses to the topical application of coal tar products and to erythema-producing ultraviolet rays produce conflicting results as far as pigmentation is concerned. Such a combination is offered in the treatment for vitiligo and leukoderma, and a like combination is also offered as the solution of etiology of perfume dermatitis.

The biologic reaction of the skin to sources of light must also be considered in cancer of exposed surfaces of the skin and in some industrial dermatoses.

Ultra-Violet Radiation in Its General Application to Disease. W. Kerr Russell, Medical Officer in Charge of Light and Electrical Departments, Miller General Hospital for South East London, England, in the Canad. M. A. J., XXVI:1:62, January, 1932.

In many of the rheumatic disorders it has been found that the skin temperature is habitually below normal, the skin is inactive, perspiration rarely occurs, and the response of the skin to sudden variations in temperature is extremely sluggish. These cases receive great benefit from general irradiation of the body, especially when a powerful carbon-arc lamp is used as the source of ultra-violet radiation. The physiological condition of the skin improves, the skin capillaries dilate, and hence there is an enhanced blood supply to the epidermal and dermal cells; the sweat and sebaceous glands become more active and, what is perhaps the most important fact of all, the skin becomes warmer and reacts more readily to changes of temperature, so that the patient loses that chilled feeling when his surrounding temperature is lowered.

Ultra-violet treatment is often of value in the treatment of chilblains.

The power of ultra-violet rays to produce a beneficial inflammation can be made use of in such conditions as indolent ulcers.

Ultra-violet radiation is also invaluable as a counter-irritant. It has been suggested that a mustard plaster is equally efficacious. A very valuable use of this counter-irritant effect is in cases of pain following the extraction of an impacted wisdom or other tooth.

GENERAL IRRADIATION

Ultra-violet rays, however, are most frequently and successfully used for the irradiation of the whole body. It is true that the ultra-violet irradiation as a beneficial psychological effect on patients; so also has natural sunshine and this effect is of benefit in many conditions where the hopeful outlook of the patient is of great importance. The creation of this confidence is often invaluable, and turns the scale between success and failure. There are other effects following general irradiation which are equally important. These are: the production of Vitamin D in the body; the action of ultra-violet rays on the blood; the action of ultra-violet rays on the sympathetic nervous system.

TONIC EFFECT

Ultra-violet irradiation has been proved to have a stimulating tonic effect in a large number of conditions, particularly in cases of post-influenzal debility; also after prolonged fever or suppuration, and after operations.

The Treatment of Whooping Cough. Arthur J. Turner, M.B., B.S., Late Medical Officer of the Uxbridge Joint Isolation Hospital; late Medical Officer of Health, Uxbridge Urban District Council, in the Practitioner, 763:CXXVIII:1:66, January, 1932.

Before detailing my method of applying the ultra-violet light I should like to point out what the advantages of this form of treatment are: First, there is no uncertainty as to the medicine being retained; next, there is no unpleasantness of taste to add to the child's distress; neither is there the fright of needle injections. The control of symptoms is speedy, if not wholly, at least in part. There is, therefore, less loss of nourishment and of strength, less mental as well as less physical distress, less cough, and therefore, more sleep.

My plan was to expose the whole body to the ultra-violet rays at a distance of 36 in., the patient lying down, first on the back and then prone. Until the principal symptoms had disappeared this exposure was made once a day and then twice a week for one or two weeks. The first dose varied with the age of the child from half a minute to two minutes both to back and front. Each day the dose was increased, in the youngest by half a minute each day, in the older ones by one minute each day. I am not a believer in large doses, especially when given every day, as it is very important not to produce any pigmentation of the skin, such pigmentation when produced tending to obstruct the passage of rays.

The improvement in the patient's general condition is usually noticeable from the first exposure to the light, and consists in an obvious brightening and happiness, increase in the amount of sleep obtained, increase of appetite, and later in tonicity of muscles, and if old enough, a readier response to questions put. Parents have been enthusiastic about the changes produced.

Ultra-Violet and Infra-Red Glasses. S. English, D.Sc., F.I.C., F.Inst.P., in the Brit. J. Radiol., IV:48:724, December, 1931.

On turning to the invisible infra-red (heat) rays extending from 780u upwards, we again have three types of glasses: (1) for transmitting both visible and infra-red rays, (2) for absorbing infra-red but transmitting the visible rays, and (3) for transmitting the infra-red and absorbing the visible rays. Pure fused quartz of a thickness of only one mm. is opaque to heat radiations at about 5u, so that if better transparency is desired (as in the manufacture of certain scientific instruments) recourse must be had to rock salt, which transmits up to or beyond 16u. Both soda and lime reduce heat transmission to a certain extent, but are not very effective in this respect. Practically colorless sheet glass 2.5 mm. thick, giving a light transmission of 90 percent, gave a heat transmission of 88 per cent when the clear sun was used as source and 80 percent when a 500 watt lamp was used. All the heat-absorbing glasses available today rely for their special properties on the presence of iron in the lower state of oxidation. The only difference be-

tween them is the method used for manufacture to reduce the iron oxide to this ferrous condition, for it must be remembered that when a glass containing iron oxide is melted without any attempt to control the state of oxidation, then the two oxides (ferric and ferrous) are both present in a state of equilibrium. The best way to introduce the iron and the necessary reducing agent is to add them in the form of iron tartrate, which decomposes under the action of the heat of the furnace, and the iron oxide and its reducing agent are then formed separately, but in intimate contact; more recently non-organic reducing agents have been used with success. In general the strong heat absorption is accompanied by poor light transmission, but the two factors are not accurately proportional to one another. By the use of such glass it is possible during the hot sunshine out-of-doors to keep the temperature indoors quite cool. Of course, the blue-green color of the glass is not in its favor, but in artificial illumination this type of glass finds a useful field, especially in those cases in which a high concentration of light is required without the ordinarily attendant heat, e.g., in certain types of hospital operating units.

A very interesting glass has the power of absorbing all visible rays, but transmitting infra-red rays. Such a glass appears black in thicknesses of 2 mm. and upwards, but in very thin sections it is a reddish amber color. As a means of invisible signalling it has almost superseded Wood's glass, since infra-red rays are easier to produce in quantity than ultra-violet rays, and they also have the great advantage of carrying further, as they are not easily absorbed by the atmosphere. For burglar alarms and apparatus of that type this glass has an interesting field of usefulness.—The Electrical Review.

Measurements of Transmission of Radiation Through a Non-Homogeneous Medium, Viz., the Horny Layer of the Human Skin. T. C. Angus and H. J. Taylor, in Proc. Roy. Soc., 109:B763:309, December 2, 1931.

SUMMARY

(1) A method is described for measuring the percentage transmission of radiations through a non-homogeneous material, viz., the horny layer of the skin.

(2) A series of experiments on this material is described, in which visible and ultra-violet radiations between λ5790 and λ2300 were used, pure monochromatic radiations being assured by the use of double monochromators.

(3) Two methods for varying the intensity of the radiations from a mercury vapour lamp by known amounts are described, and a photographic method of measuring the relative intensities of radiations.

Calibration of the Lovibond Tintometer and of the Actinometer for the Levy-West Ultra-Violet Light Pastilles. Philip Wright, Ph.D., University College of North Whales, Bangor, in the Brit. J. Radiol., IV-48-715, December, 1931.

A Pastille method of estimating ultra-violet light dosage was described a few years ago by Levy and West which, because of its efficiency and simplicity, has since been employed extensively in therapeutic work. The pastilles are made from chloralformamide and diphenylamine, and are reactive to ultra-violet radiation in the range 3,800 to 2,300 Å.U., giving color changes which can be measured by comparison with a set of standard tints. Where a high degree of accuracy is not required, the tints assumed by the pastille are compared with a series of permanent standards made from pigments. In more accurate determinations, a tintometer is employed and the comparison standards consist of various combinations of red and yellow filters through which a white surface is viewed and compared with the pastille.

The sets of permanent standards were obtained by comparison with pastilles which had received multiples of a chosen unit dose of ultra-violet light. This was accomplished by exposing pastilles to the radiation from a tungsten arc for measured intervals of time. The tints for longer doses were ascertained by exposing pastilles to successive changes of one unit, each additional dose being measured by simultaneous exposure of a flush pastilles which was compared with the arbitrary standard tint for one unit of dosage. The tints were finally checked by timed exposures to bright unclouded sunshine.

Both of the above methods of obtaining the set of standards are open to objection. The former may be in error on account of fluctuations in the emission from the tungsten arc, whilst the latter involves an error which increases with the number of pastilles compared at unit dose intervals. In the present investigation, the existing color standards for the Levy-West ultra-violet light pastilles were calibrated by comparison wih the dose as measured by a photo-electric cell. The work may be divided into two sections:

(1) The set of tints supplied with the Levy-West Actinometer, used in the investigation, were compared directly with the tints of a Lovibond Tintometer. Throughout these observations the tintometer was used under the conditions stated by the makers, the room being darkened and illumination provided by the standard carbon filament lamp supplied with the instrument. The results given in Table 1 are the means of the comparisons of several independent observers which agreed closely amongst themselves. These results refer to the indications of the instrument as received from the makers.

(2) The ultra-violet dosage was accurately measured by means of a photo-electric cell which was fitted with a cathode of aluminum and a quartz window and was known to be sensitive to ultra-violet radiation of wavelengths between 3,130 Å.U. and 1,850 Å.U. with a maximum sensitivity at 2,200 Å.U. A gold leaf electroscope was connected to the cathode of the photo-electric cell. Over the period of time during which these experiments were carried out the sensitivities of the cell and of the gold leaf system of the electroscope were checked daily and found to be constant.

Peritonitis of Tuberculous Origin. E. L. Eliason, M.D., Philadelphia, in The Pennsylvania M.J., XXXV: 3:178, December, 1931.

Treatment.—The proper treatment of this disease is the combination of the general treatment for tuberculosis and the intelligent use of surgery. General treatment consists of the proper dietary and hygienic care of tuberculosis, and the employment of ultraviolet rays, either by direct sunlight or by the quartz lamp, given to the entire body, as the effect is a general and not a local one because the rays cannot penetrate the skin. Many writers have contributed accounts of favorable results from this treatment alone. In evaluating these results, however, when used without surgery it must be borne in mind that the diagnosis is merely an inferential one, and therefore the improvement or cure may be a false assumption.

The roentgen ray and radium have been credited with some good results. Pancoast, however, is rather skeptical of the value that can be ascribed to their use as here again enters the doubt of an unproved diagnosis in the absence of surgery.

Surgical treatment.—Surgery has to offer the several

procedures of laparatomy, alone, laparatomy with eradication of the focus, paracentesis with the removal of fluid, paracentesis with fluid removal and the injection of air or oxygen, and pneumoperitoneum.

Physical Exercises in the Prevention of Pulmonary Tuberculosis. G. Dick Read, M.A., M.D. (Cantab), in the Brit. J. of Phys. Med., VI:9:186, December, 1931. It is not intended to convey the impression that physical exercise will prevent pulmonary tuberculosis, for owing to certain circumstances, men and women of the finest physical development and of athletic type, have succumbed to this disease. Few of us have not been shocked and puzzled by these cases. There are deficiencies in physical development which appear to predispose to the contraction of pulmonary tuberculosis; these unhappily are conditions all too frequently seen, though frequently unrecognized. They are to some extent due to structure, but to a much larger extent due to habit, physiological weakness and inherent temperament qualities. If tuberculosis is hereditary, it is probably that the physiological activities and the temperament are as likely to convey the inherited tendency as the anatomical structure of the child.

Up to nine years of age it is possible to do little in the way of specialized physical exercises. To what extent physiological and psychical factors may be corrected is not included under this heading. It is important to note, however, that the physical development of children up to the age of nine is as essential in its perfection as the foundation of any building.

About the age of nine, however, the physical manifestation of the combined characteristics predisposing to development of pulmonary tuberculosis may be detected. There is an absence of the typical picture of the robust child. At the time when the abdomen ceases to be relatively protuberant, when the lumbo-sacral angle commences to straighten up a little, and when the ribs adopt the set which makes the permanent shape of the chest, it is possible to prognose the deficiency of the respiratory system of the child.

Exercises primarily intended to educate and maintain perfect respiration must be given when the body itself demands the full use of its respiratory function, and much harm has been done by taking children straight from the class-room to the gymnasium, and, without preliminary exercises, calling upon them to perform deep respiratory movements. I have seen them endeavor to carry out these exercises when there has been no physiological demand for deep breathing at all. This not infrequently results in giddiness, lack of interest and boredom. Before muscles of respiration are called into full play, such muscular activity should be provided that there is a call by the circulatory system for increased oxygenation. Then the child may breath deeply with impunity, and will experience none of those discomforts which we may experience experimentally if, having been at rest, we suddenly take 20 or 30 deep respirations.

Effects of Exercise on Experimental Cardiac Infarction. Don C. Sutton, M.D., and Milton D. Davis, M.D., Chicago, in Arch. Int. Med., 48:6:1118, December, 1931.

CONCLUSIONS

Apparently rest after myocardial infarction results in the production of a small firm scar while early exercise results in a thin bulging scar. The hope was entertained of proving this more definitely as a clinical fact, but evidently the reserve of a normal dog's heart is infrequently greater than that of an arteriosclerotic heart.

Myocardial infarction per se does not cause hypertrophy.

Note: Dr. A. C. Ivy gave assistance and encouragement in this work.

Treatment of the Asthmatic by Physical Exercises. A. H. Douthwaite, M.D., F.R.C.P. (Physician i/c Massage Department, Guy's Hospital; Hon. physician, All Saints' Hospital), in the Brit. J. of Phys. Med., VI:9:190, December, 1931.

Not only is one faced by the problem of a distended and rigid thorax, but one also recognizes that the tenseness of the respiratory musculature seems, as it were, to overflow to the muscles of the neck, face, abdomen and even limbs. This is the natural utcome of excessive tone of any group of muscles, and is accentuated by the state of apprehension which characterizes the outlook of the majority of asthmatics.

It is clear, therefore, that physical exercises must commence with the practice of relaxation, without which no amount of physiotherapy can be of benefit.

MUSCULAR RELAXATION

It may be necessary to devote many sittings to the attainment of flaccidity before any other exercise be instituted. The patient should lie on his back, on a comfortable couch, in a darkened room, which must be well warmed. At the first the trunk is covered, but the limbs exposed, and when complete relaxation is produced in the extremities, the thorax and upper abdomen must also be uncovered. The patient is then instructed to breath slowly and deeply; the respiratory rate thus falls to about six per minute. At the same time he is urged to allow his limbs to lie as a dead weight, as if they no longer formed an integral part of his body. The success or failure of his efforts can be appreciated by a glance at the legs, which roll outwards with complete relaxation, and arms which rotate inwards, accompanied by drooping of the shoulders when the same state has been induced in the corresponding musculature.

The duration of the relaxation exercises should be gradually extended from ten minutes to half an hour. They alone, if properly performed, produce a great benefit in allaying apprehension and inducing a feeling of well-being.

Treatment of Dysmenorrhoea by Exercise. Alice E. Sanderson Clow, M. D., B. Sc., B. S., Cheltenham, in the Brit. M. J., 3704:4, January 2, 1932.

I wish to make it clear that my remarks refer only to cases in which the general health is good and in which there is no evidence of appendicitis or of pathological conditions of the genital organs. They include, however, variations in the size and shape of the body and cervix of the uterus, the pelvic organs being in most cases examined per rectum. Having ascertained that the patient is in good health and that the disability, whether it be pain, vomiting, nausea, headache, or malaise, occurs only in association with the menstrual period, I class it as a case of dysmenorrhoea, and give advice to the patient which may be referred to under the headings of hygiene, exercise, baths and drugs.

HYGIENE

I explain to the patient that menstruation is a natural function and should be as free from pain and internal discomfort as are the other functions of the body; that, in the majority of women, this is the case; and that, since her organs are healthy, there is no reason why she should not overcome her disability during the period. I insist that the normal routine of life should not be interrupted during menstruation. The diet, daily bath, and action of the bowels should be as usual.

There should be no reduction in the amount of exercise taken at other times. Active work is beneficial, as are outdoor games such as tennis and hockey, walking, riding, cycling, and rowing. No extra rest is necessary during the period; it may even do harm, as it is important to keep up a good circulation of the blood. The sensation of fatigue felt by some on the first day of the period is, in most cases, quickly dispelled by a warming exercise; whereas it is prolonged by rest, although the recumbent position produces an initial feeling of relief.

EXERCISE

The patient's history generally serves as an explanation of the cause of her dysmenorrhoea. It is usually found that the age of its onset, most commonly 16 to 19, corresponds with some change in the daily routine, involving more restricted time for exercise and increased hours of work, owing to study for an examination, or entry to an office, shop, or factory. With the first indication of menstrual trouble the inclination is to reduce the exercise still further, and, if possible, to lie down during the time of malaise.

I have selected a few movements as being specially effective for dysmenorrhoea, and I have had them printed on a single sheet, which I give to the patient, and tell her to do them for a quarter of an hour daily for a few days before the onset of the period and on no account to fail to do them on the first and second days of the period. They should be done with enough vigour to promote a sensation of heat or gentle sweat. After continuing the treatments for six to twelve months, many are able to leave it off altogether provided they are not engaged in sedentary occupations.

Table of Exercises

1. *Floor Polishing.*—Kneel on "all fours." Swing right arm with elbow stiff, through a semicircle, as if polishing the floor, reaching as far forward and as far back as possible. Repeat swing ten times with each arm.

2. (a) *Bending.*—Stand with feet apart. Stretch arms above head, bend forward and touch ground with knees straight. Return to first position. Repeat slowly eight times. (b) Twisting.—Stand with feet apart. Stretch arms to side on level with shoulders. Twist trunk around until right arm points directly backwards. Twist again until left arm points directly backwards. Repeat vigorously ten times. (c) Swaying.—Stand with feet apart. Stretch arms above head. Sway body and arms to right, then left. Repeat slowly ten times.

3. *"Rowing."*—Sit on floor with knees straight and feet pressed against wall. Lean forward and touch wall with knuckles, allowing knees to bend slightly. Repeat rhythmically twenty times.

4. *Right to Left and Left to Right.*—Stand with feet apart. Swing right arm up as far as possible. Bend down, bringing right arm over and touch left foot. Repeat six times. The same with the left arm and right foot.

5. *Floor Patting.*—Kneel, sitting back on heels. Twist body and tap floor with both hands four times on left side. Kneel upright. Twist body and repeat tapping on right side. Repeat eight times each side.

6. *Bean Picking.*—Throw twenty small objects, such as beans, on the floor. Pick up one at a time and place on a shelf above the head, using hands alternately. Do it as quickly as possible.

BATHS

Most patients are still under the impression that it is unsafe to take a bath during the period, so they are told that in spite of the old prejudices, baths are not only harmless but beneficial. The complete daily wash is a necessary hygienic measure, but immersion in a warm bath at night is not only salutary, but checks or helps to prevent the onset of aching and discomfort. There is no harm in the continuation of the cold morning bath or cold sponge during the period. For women subject to severe dysmenorrhoea, who are nervous or otherwise unfit for muscular exertion, immersion of the whole body in a hot bath (100°F) for ten to fifteen minutes just as the period begins is a good prophylactic against pain, and will often relieve a patient already in pain. Its effect, being quicker, is more striking than that of exercise, but it has relative disadvantages in that it must be followed by rest in bed for at least an hour, and, unless the patient can keep thoroughly warm afterwards, preferably by muscular effort, the pain is apt to return.

DRUGS

For drugs I have little use in the treatment of dysmenorrhoea, and since prescribing the remedial exercises in printed form I have been spared the reproachful look of disappointment from the patient when told that there was no prescription to take away. There are, however, a relatively few cases in which a nerve sedative or analgesic is useful while patients are learning to trust themselves to the new practices advised.

In nearly twenty years of practice I have had just over 400 cases of dysmenorrhoea of varying degrees of severity which have been cured or relieved by treatment with baths and exercise. Fourteen patients have complained that they felt worse after the exercises, though no increase of disability persisted. But since three of the severest of these cases have, through force of circumstances, ultimately cured themselves by muscular exertion, I have ceased to be discouraged by the failures.

Effect of Exercise on Colonic Motility. Abst. in Jour. A. M. A., 98:7:582, Feb. 13, 1932, from Am. J. Physiol., Baltimore, 99:52, (Dec.) 1931.

The effects of short periods of strenuous treadmill running on the motility of the colon of dogs completely recovered from appropriate surgical intervention were recorded by DeYoung and his associates by the balloon method in a series of nine dogs. It was found that during an exercise period there is in a majority of cases a marked rise in colonic tone and motility. The rise is not coextensive with the running period. It begins usually from one to three minutes after the start of exercise and recedes after a few minutes without reference to the duration of exercise. From studies following a variety of denervation procedures it is concluded that the appearance of the rise depends on the intactness of at least one of two parasympathetic inflows, probably vagal, entering the colon over the ileocecal juncture from above. The rise did not appear in a dog that ran with evident fear of the treadmill until after he had been conditioned to run without this emotion. Following the exercise period there is usually a period of subnormal activity of varying length—sometimes as long as forty-five minutes.

The Conservative Treatment of Backache. Lloyd T. Brown, M. D., Boston, Massachusetts, in J. Bone & Joint Surg., XIV:1:157, January, 1932.

In the examination of the spine the first point to be investigated is the position in which the joints of the spine are habitually used (Fig. 3). Is there present the

normal amount of the factor of safety motion? In good body mechanics (A) in the standing or sitting position, the weight of the body is carried on the bodies of the vertebrae with the intervertebrae discs acting as shock absorbers. The articular facets act largely as stabilizers; they are not structurally placed or built to support the whole weight of the body. In good body mechanics the articular facets will be so articulated that there will be a factor of safety motion in either direction. In bad body mechanics (B) in the standing position, with the usual lordosis in the low lumbar spine, the weight of the body is thrust backward so that it comes on the posterior half of the vertebrae and especially on the articular facets. In such a position the factor of safety motion in the direction of extension must be absent. In the sitting position or in the forward bending position, in bad body mechanics, the weight of the body is changed more to the front part of the bodies of the vertebrae and the articular facets change their positions so that the factor of safety motion in the direction of flexion must be absent. In either of these two positions, extension or flexion, the strain from the weight of the body must come on the joints of the articular facets at the extremes of their range of motion which, as said above, is a potential of injury. This potential of injury, which means stretched and relaxed ligaments must be compensated for by muscular action or by motion elsewhere in the spine or extremities. If this necessary compensatory action, which is largely reflex, does not function quickly enough—as in lifting or in sudden unexpected motions—there is possibility of acute injury to these joints or to the muscles in this region. Such possibility of injury is, of course, greatly increased if the general condition of the patient is one of marked fatigue, or if there is an infection present. The quickness of the response of this compensatory action must also be effected to a greater or lesser extent by the innumerable slight strains caused by habitual faulty body mechanics, none of which strains amount to much, but the sum total of which leads to a chronic strain fatigability.

The conservative treatment of backache is based on a knowledge of the fundamental mechanical principles stated above. The first requisite of such treatment is rest, and the second is function in the correct position.

In the treatment of a sprained ankle, the combination of rest and function is used as soon as possible after the injury. If the strain is severe enough, the treatment is complete rest until the inflammation has quieted down, followed as soon as possible by function with strapping to prevent further injury. The strapping is always applied to keep the foot from getting into positions which could cause further strain. If the injury is not too severe, immediate function is begun with strapping for protection.

The same method of treatment is equally important and efficient with backache. It is, however, more difficult to carry out and requires more knowledge and patience. The following is an outline of the treatment of a man who had suffered off and on for ten years with pain in the back and alternating sciatica. At first the attacks were infrequent but as time went on they became more common, until he was unable to ride in an automobile or lift anything or at times lean over to put on his shoes without getting a catch in his back. As he was a prominent man, he had had many opinions, the majority of which were for the operative method of treatment.

Of equal importance to the story of backache in this man was a long-standing history of indigestion, constipation, headaches and nervousness, for all of which there had been hospital and sanitarium treatment. The man himself was an unusually intelligent and mentally well-poised individual who realized that his present condition was entirely due to long hours and overwork for many years. Further examination of this man showed a subnormal temperature, a systolic blood pressure below 100, and extreme fatigue. The treatment, accordingly, was planned on the basis of rest and then function. As is not uncommon, this man found it very difficult to stay in bed as the bed made the backache more uncomfortable. Nevertheless, as recumbency is the only way possible to take the weight off the vertebrae and get complete rest, it was the doctor's job to make this position possible. This can usually be done by placing one or two pillows under the knees, thus flexing the hips enough to take the strain off the lumbar spine.

Along with these positions the patient was immediately started on abdominal and breathing exercises, all of which were the first steps in the postural education which would fulfil the second fundamental principle of treatment,—namely, function with the best weight-bearing lines. As soon as possible the stretching out of the dorsal spine and ribs was begun by means of the hyperextended position, as it is obviously impossible to acquire the correct body mechanics by treating only one part of the body. The next step was the problem of teaching the patient to use his body in good mechanic alignment when up and around. A brace was planned which, although it could not hold him in the correct position, would help him to so hold himself. This brace was planned not only to give support to the pelvis, lumbar spine, and abdomen, but also to give support to the lower half of the dorsal spine. The reason for this latter support was to put the weight of the upper body more on the front of the lumbar vertebrae and less on the articular facets. The exercises in the meantime had gradually been changed so that the patient had now been shown how to use the body more correctly in the sitting, standing, and bending positions. It was a relatively easy task to relieve the backache, but it will take time to overcome the long-standing fatigue.

Colon Irrigations, Their Administration, Therapeutic Application and Dangers. Walter A. Bastedo, M. D., Sc. D., New York, in Jour. A. M. A., 98:9:734, Feb. 27, 1932.

The colon irrigation has come into extensive use for the removal from the bowel of abnormal mucus, toxic products and bacteria; therefore, as part of our therapeutic armamentarium, it deserves consideration. Between enemas and irrigations there would seem to be no sharp dividing line, yet they are distinct in their purposes. In medicine, the term irrigation conveys the idea of washing; therefore, while the ordinary enema is given with the purpose of inducing defecation, the irrigation is administered, not to induce defecation, but to wash out material situated above the defecation area and to lavage the wall of the bowel as high as the water can be made to reach. To accomplish its purpose an irrigation requires (1) that the fecal mass in the lower colon shall have been expelled and (2) that the liquid shall be passed into the colon so gently that it does not arouse the defecation relexes. Otherwise it is not a properly given irrigation.

METHODS OF IRRIGATION

There are two primary methods in common use, the one tube and the two tube.

Irrigations are not given to move the bowels but rather to reach the regions beyond the defecation area of the left colon, the region not cleaned out by defecation. Just as a stomach is lavaged with water until it is clean, so is an attempt made to lavage the colon until it is clean. True, one can fill the colon with 2 quarts of water, have it pass to the cecum in two or three minutes, as shown by roentgenograms, and have it reexpelled. But this does not suffice. In mucous colitis the thick tenacious mucus may take a lot of soaking before it can be liberated from the mucous membrane to which it clings so tightly.

It must be evident that if the whole colon is irrigated the water cannot return clear, and that a "clear return," as so frequently reported by the unspecialized nurse, means that the water did not get up.

For ordinary mucous colitis, putrefaction of focal infection cases I employ the irrigation two or three times a week at first, then every five days, then once a week. I use irrigations oftener only in acute cases of other types.

In some circles there has been much criticism of the use of irrigations in mucous colitis, but I have been able to relieve many patients who have been denied the advantage of irrigations by physicians opposed to the procedure.

Those who need irrigations must be distinguished from those who do not need them, for there are many persons, especially those with mucous colitis, who acquire the irrigation habit and resort to this measure whenever they become conscious of the lower part of the abdomen or feel what they describe as "toxic." They are encouraged in this attitude by the commercialized irrigation specialists, who are unduly numerous but do a thriving business. But this self-medication should be combated by the physician.

The method is not to be condemned because it is overused by exploiting nurses; but physicians are to be condemned who order frequent irrigations without specifications, who do not examine the character of the return, and who base their subsequent treatment of the patient on the usual perfunctory report of a nurse. It requires an intelligent, experienced and interested operator to observe properly and to assess correctly the character of the mucus and fecal matter and the significance of the sundry odors that are obtained at different times during the irrigation.

SUMMARY

I have been considering the methods of administration, the therapeutic application, the abuse, and the dangers of repeated or routine colon irrigations. These are employed in chronic states of the bowel, such as are encountered in mucous colitis, intestinal putrefactive toxemia and in cases in which a focus of infection is believed to reside in the bowel, as in certain cases of rheumatism, neuritis, secondary anemia and sundry run-down conditions. There are many other acute and chronic conditions in which an irrigation may be found useful, but of these I have omitted discussion.

In recapitulation: 1. A colon irrigation is a process of lavage to be distinguished from an enema. 2. It is given to dilute and wash out the contents of the bowel above the normal defecation area, to soften and loosen abnormal mucus and to lavage the colon wall. 3. It leaves the colon more or less empty and contracted and thus exerts a beneficial effect on its blood supply and its tone. 4. It should be preceded by defecation and should be administered very slowly and without much pressure. 5. The one tube and two tube methods are employed, the tubes being inserted not more than 6 inches. 6. The high insertion of a large rather stiff tube is dangerous and without proved advantage. 7. The dangers of the stiffer tube are perforation, injury to a polypus, tearing of a rectal valve, and abrasion of the wall. 8. The charges that irrigations do harm by removing normal mucus, by lowering the tone of the bowel and by producing colitis are without foundation. 9. An irrigation is frequently a failure in the hospital ward and in the hands of the unspecialized nurse.

I trust that my warnings against its improper administration, its dangers and its abuse will not discourage physicians in the proper utilization of this valuable therapeutic measure.

Sympathetic Activity in Certain Diseases, Especially Those of the Peripheral Circulation. W. J. Merle Scott, M. D., and John J. Morton, M. D., Rochester, New York, in Arch. Int. Med., 48:6:1065, December 1931.

Treatment.—The differentiation of occlusive and spastic vascular diseases the estimation of the relative proportions of each when both are present are of prime importance because the principles on which the treatment for these groups must rest, differ radically (Fig. 27). In the group in which symptoms are entirely dependent on occlusion, nothing whatever is gained by the elimination of vasoconstrictor activity. Sympathectomy for such patients is unjustifiable. Besides symptomatic relief from discomfort and the avoidance of infection, treatment should be directed to one thing, namely a more efficient peripheral distribution of the blood. Venous ligation seems to offer some assistance in this direction. It is probably in this manner also that one in such cases may be some alleviated by depression of the level of the foot gravity, therapy being used to assist in the forcing of blood through the most distal parts. It is not our purpose to discuss extensively the treatment for occlusion. We are not particular to emphasize that there is no evidence of participation of the sympathetical activity in this group. On the other hand, in conditions in which spasm is present, the treatment is entirely different and should consist in measures to overcome the spasm. There are several ways in which this problem may be attacked.

1. *Overcoming the inflammatory process.*—The most direct and satisfactory procedure would be to overcome the inflammatory process. In the arterial spasm of thrombo-angiitus obliterans and Raynud's disease we do not yet know the primary cause of the reaction.

2. *Vasodilator drugs.*—It is natural next to turn for assistance to the pharmacologic agents that cause vasodilation or oppose sympathetical stimulation. We have tried out in this connection the nitrites, acetyl choline ergotamine, but we have not been able to obtain an immediate effect on the peripheral vessels of the extremity in artesial spastic disease that at all approaches the interpretation of the sympathetical fibers.

3. *Local heat.*—In certain forms of arterial spasm heat applied locally relaxes the spasm. This is particularly true in certain traumatic lesions. It is impossible to use readings of the surface temperature directly as an index of the effect of local heat on the vascular circulation. We have studied in isolated instances the normal lack of time, heat, and cold, but have not yet established satisfactory criteria for the normal limits. The effect of local heat in arterial spastic disease is not as lasting as the application of heat to raise the body temperature.

4. *General heat.*—We have produced hyperthermia in these patients by two methods: (a) Diathermy, and (b) hot baths. Dr. S. L. Warren supervised the diathermy treatments which consisted in passage of five

amperes of high frequency current (wave length 300 meters) through the body between each electrode. The continuous hot baths were given by the method recently advised by Mehrtens and Pouppirt. In all cases both procedures caused a relaxation from arterial spasm which outlasted the hyperthermia produced (Figs. 28, 29 and 30). Pain was temporarily alleviated. We have not yet followed these patients long enough to determine how effective these measures will prove in permanently keeping the spasm under control. We believe, however, that they produce a much more desirable form of hyperthermia than that following foreign protein.

5. *Foreign protein.*—The injection of various types of foreign protein has long been used in the treatment of several conditions, among them peripheral vascular diseases. The severity of reactions here or not associated with applications makes it not an ideal form of treatment.

7. *Ganglionectomy.*—Approximately the same cure of vaso-dilation that can be temporarily induced by anesthesia can be made permanent by sympathetical ganglionectomy in the proper area.

The Management of Chronic Arterial Occlusions of the Extremities. Geza de Takats, M. D., M. S., F. A. C. S., Chicago, in Illinois M. J., LXI:1:79, January 1932.

Treatment of peripheral vascular diseases: The objects of treating organic occlusions of peripheral blood vessels are the following: 1, efforts to increase collateral circulation; 2, efforts to alleviate pain; 3, removal of gangrenous parts at proper circulatory levels.

The increase in collateral circulation can be favored by strengthening the heart of arterio sclerotics with myocardial damage. This must be done by a close cooperation with an internist, who can accomplish a great deal by improving the central motor with digitalis and decreasing the peripheral resistance by theobromin preparations. In the periphery, circulatory exercises, continuous heat during the night with an electric baker, hot and cold alternate baths, lumbar diathermy all have a limited value. Early cases of circulatory impairment may very definitely be benefited and the progress of the disease may be arrested. It is clear, however, that in a complete vascular occlusion, with adequate collateral circulation such measures can only fail and do no good.

The treatment of spastic occlusions aims to overcome the spasm. Heat in any form relieves local spasms temporarily. Diathermy, electric bakers, whirlpool baths help in mild cases. Sometimes it is possible to remove the cause of such spasms, as for instance, in a case of cervical ribs or other mechanical irritations of vasometer nerves. Young girls with cold hands and feet, chapped dry skin and chilblains have frequently low metabolic rates and their circulation greatly improves with thyroid therapy. More severe, continuous spasms, which are progressive and lead to symmetrical gangrene are subjected to sympathetic ganglionectomy. For the upper extremities the stellate, first and second thoracic ganglia, for the lower extremities the second, third and fourth lumbar ganglia must be removed in order to remove all sympathetic fibers going to the extremities. While there may be a discussion about the origin of these vascular spasms, sympathectomy undoubtedly prevents further contraction of the vessels and have proved to be very successful in true vascular spasms.

Pemphigus. Jay Frank Schamberg, M. D., Professor of Dermatology and Syphilology, Graduate School of Medicine of the University of Pennsylvania, Philadelphia, in Arch. Dermat. & Syph., 25:1:134, January 1932.

RECOVERY FOLLOWING LONG-CONTINUITY COLONIC IRRIGATIONS AND ARSENIC BY MOUTH

I wish to report a complete recovery from pemphigus in a Russian Jew, in whom the disease had advanced to such a degree that he was almost in the extremis. Indeed, it was thought that his death was only a few days off.

Another patient was seen in consultation in a distant city. This man, over 50 years of age, was a Jew of Eastern European birth, and had a severe pemphigus which had resisted arsenic and other methods of treatment. After six weeks of treatment he is generally improved and contemplates leaving the hospital shortly. The treatment consisted of colonic irrigations and the internal use of acetarsone (stovarsol) in broken courses.

The treatment prescribed for my patient was solution of potassium arsenite, 5 minims three times a day, and colonic irrigations of 8 gallons of water three times a week. This was kept up for months. Meat, fish, fowl and eggs were excluded from the diet.

I am much more inclined to the belief that the cure was in large part due to the colonic irrigations. Indeed, the reason why I instituted the colonic irrigations was a cure in a malignant case in a Jew, some years ago, personally narrated by Dr. John C. Hemmeter of Baltimore. The patient had been treated with arsenic over a long period of time by many dermatologists without being benefited. Dr. Hemmeter treated him with colonic irrigations for one year and cured him, without the use of arsenic.

The favorable result in these two cases suggested to me the thought that possibly pemphigus was due to an alimentary infection. In our Research Institute my co-workers and I fed a monkey on the excrement of a pemphigus patient which was mixed with banana pulp. We also cultivated a number of intestinal bacteria from the pemphigus stool and fed these to monkeys. The results were entirely negative.

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